The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. I. AUGUST 2, 1919 No. 7.

Contents

	PAGE
Editorial Notes: Resuming Trade with Germany; Our Real "Protection"; Hydrogen; American Labour and Science; Two New Bills; Chicago Chemical Exposition	183-185
Recent Developments in Industrial Catalysis (I). By DR. HUGH S. TAYLOR	186-188
Sodium Chloride and Blue-Powder Formation. By REGINALD S. DEAN	188
Conditions in British Alkali Works: Annual Report of Chief Inspector (I)	189-190
General News	191-196
From Week to Week	197
References to Current Literature	198
Patent Literature	199-201
Market Report and Current Prices	202-204
Stocks and Shares	204
The Indian Market	205
Company News	206
Commercial Intelligence	207

NOTICES:—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- Abroad. Cheques, P.O.O.'s, and Postal Orders should be payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.
Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines)

Resuming Trade with Germany

THE attention of British exporting firms may be directed to an important White Paper (Cmd. 274), which the Board of Trade have issued on the subject of resuming trade with the Central Powers. Those who have preached the doctrine of "No trade with the Hun" will probably be a little shocked at its contents, for here, in the cold language of economics, our traders are advised to cut in as quickly as possible, and get all the trade they can out of the nations with whom we have been at war. The White Paper states that with the conclusion of peace with Germany the necessity for the prohibition of trading with the enemy has ceased. It may be expected that there will be a considerable demand in Germany for all kinds of goods, and with the raising of the blockade, this market will be open to all the world. It is no part of the policy of the Government, it is stated, to discourage British traders from competing in this market. It is necessary in the interests of this country to develop export trade to the fullest extent in every direction, and it is very desirable that British traders should at once make every effort to secure a proper footing in Central Europe. So all our magnificent sentiment is dropped, and under the pressure of trade necessities the Government bid us get as many German and Austrian customers as possible. The advice is based on the fact that the United States, and, no doubt, other of our Allies, are eager to supply the needs of the Central Powers, and, if we refuse to follow their example, the penalty will be loss of trade, a penalty which, in view of our enormous financial obligations, we cannot afford to incur.

With this official approval, and, indeed, incitement, we may take it that British exporting firms will, like their rivals of other nations, seek to secure the custom of the Central Powers. If it were merely a matter of selling our products for cash to German or Austrian customers no difficulty would arise; but international trade cannot be a one-sided transaction. It is an axiom that exports and imports pay for each other; in simpler terms, the people we sell goods to we must buy goods from. When the Board of Trade, therefore, recommend us to sell as much as we can to Germany and Austria "in the interests of this country," they know that the despatch of our goods to Central Europe involves a corresponding import of goods from Central Europe into this country. It is this half of the transaction that needs to be kept in mind. Before the war this was an open market to the world, and Germany, in particular, swamped us with dyes, chemicals, textiles, furniture—everything, in fact, down to picture post cards of our State palaces and cathedrals. It was due, it must be recognised, to German industry and enterprise—good business qualities which it is useless to ignore—coupled with our own indifference. Germany found it worth while to attend to what we neglected, and, if she had been content with the natural fruits of this industry and initiative, probably no one would have bothered about it. But the war opened our eyes to the danger of this easy and cheap dependence for necessaries on a foreign power, and forced us to begin providing for ourselves. We are at present half-way through the process of providing for ourselves, and that process must not be interrupted, nor must the efforts and expenditure of the past few years be thrown away by the sudden and unrestricted opening of our markets to the Central Powers. In the matter of dyes and chemicals it will be necessary to keep an eye on the import regulations, and to see that, while they are liberal enough to give our export trade a fair chance with that of Allied nations, they are not so lax as to wreck the new and promising industries which are now, at great cost and exertion, being built up in this country.

Our Real "Protection"

WHILE it is generally recognised, in our present circumstances, that imports must, for a time, be carefully regulated, it is essential to our efficiency as traders that we should not be led to rely on artificial safeguards. Our real protection lies in our ability to produce more and even better goods than our competitors, and the safety of national trade depends in the end on the quality and quantity of our output. If these are unequal to

those of rival nations, it is difficult to see what can save us; we can only hold our own by making our products equal to, if possible better than, the best of other nations, and to do this we shall need, especially in the chemical industry, the closest alliance between science and industry, and the fullest and most energetic use of the resources of both.

On this point we should like every member of the chemical industry to consider what Lord Moulton said in his speech at the opening of the British Scientific Products Exhibition, for it goes to the root of the matter. Describing his experiences in his official capacity during the war, Lord Moulton confessed there was one thing which made him a little ashamed of this country. "It was obvious," he said, "that the Germans were taking pains over particular products so as to produce them of a better and more uniform quality, and therefore making them more valuable to the English consumer. What was more evident than anything else was that the specialised attention which worked at a little thing in order to improve it was being guided by all the scientific knowledge that was at the command of the world. The English manufacturers were too frequently content with a quality which they could sell in very large quantities, and for which they had a safe market, and were not realising that this advance in quality would gradually bring with it a greater demand, and would make the wholesale trade pass into the hands of their competitors. The real question which interested him was how should we get England to produce the articles of higher quality at reasonable prices, which Germany had been enabled to make by means of the patience and industrial research carried out for so many years. We were like an old-established house; they were like a young house that wanted to make a business. Our nation had nothing to fear from any nation. All that it had to fear was from its own self. It had got the power of research and of invention, it had got the power of patient devotion to a particular end that it had chosen, and it had got the power of acting together on the largest possible scale. All that was necessary was that the nation should be roused to the necessity of doing it, and then, as they did during the last four years, they would prove that it could do in all this wide production that peace needed what it did in the narrow but equally important war production."

In the attempt to capture a market, the prize, in the end, goes to the firm or the nation which puts in some fraction more than its competitors, and nowhere is this more true than in relation to chemicals. Whether it is the production of dyes, or fertilisers, or fine chemicals, success depends not merely on a good average, but on some superlative quality, however slight it may be, which puts one product a point ahead of all the rest. In most cases the general body of reputable producers are on a common level up to, say, nine points out of ten, or even 99 out of a hundred. It is the tenth point, or the hundredth, as the case may be, added to the common stock, which counts decisively, and no better service could be rendered to the chemical industry than to make it conscious of the vital importance of aiming at this small margin of superiority which may make the difference between gaining or losing a market. Germany, in the past, has won much of her chemical and other trade by scrupulous attention to small points which her competitors treated with disdain. We shall have missed one essential lesson of the war if this defect on our part is not remedied for the future.

Hydrogen

THERE can be no question that the near future will witness an enormous development in the industrial uses of hydrogen. Apart from lighter-than-air machines (which will probably turn to other and safer gases, such as helium) hydrogen is likely to be employed in ever-increasing quantities for hydrogenation, and for the fixation of atmospheric nitrogen. Before the war the production of hydrogen in this country was almost a negligible quantity. As an instance of its excessive cost it may be mentioned that at the Royal Aircraft Factory at Farnborough, some few years ago, it cost about £1 per 1,000 cubic feet, being generated in this instance by electrolytic means. Such a figure would be ruinous to many of those larger undertakings interested in the hardening of oils at the present time; and in view of the importance of this recently built up industry, it is essential that a cheap and ready method of producing the gas should be evolved. Fortunately, the research carried out during the war has resulted in important developments, but although the end of hostilities found the hydrogen problem well on the way to solution, it was by no means finally settled. We can certainly claim that great strides were made, and the gas by the later processes introduced was probably being produced at a cost of some 4s. to 5s. per 1,000 cubic feet. In fact, a few firms, which five years ago had never thought of hydrogen apparatus, have carried out some very commendable work, and are prepared to instal plant which is immeasurably superior to anything at our disposal in pre-war times. The potential consumer to-day, however, finds the position decidedly nebulous, for there is little really helpful in the way of published matter, and much of the war research has never seen the light.

For use on a large scale there are three methods which stand out from the host of processes which have been advocated. First may be mentioned the "Silicol" method, which has been so largely employed for airship work. This is based on one of the more purely chemical principles, whereby hydrogen is released by the reaction of caustic soda on silicon. The process is of importance, in that the initial outlay on the plant is only about one-tenth of that necessitated by the other commercially-successful methods, and the gas is evolved so rapidly that little in the way of storage is necessary. However, so far as the actual cost of generation is concerned, there is no doubt that the so-called water gas processes are far more economical. One of these—the iron-contact system—was largely developed during the war, and is really the old Lewes-Lane principle, supplemented by improvements in practical manipulation and design. The Germans (who, according to their custom, called this the *Messerschmidt* process) employed it considerably both before and during the war; but they afterwards possessed a very much more economical process, which was worked out by the famous Badische concern, and which was more especially suited for synthetic ammonia work. Fortunately, certain details of the last-named method were known to chemists in

this country who had worked in Germany, and during the war its possibilities were appreciated, and special research was carried out by the Munitions Inventions Department. It is understood that, as a result, a thoroughly practicable process, operating on a twin catalyst system, was evolved, and that hydrogen obtained in this way costs only half as much as that generated from the iron-contact plant. It is believed, moreover, that a very large installation was being contemplated, and was being constructed at the time of the Armistice, but little has been heard of it since. It is to the country's interest, however, that some concise and authoritative statement on the various methods employed by the Government should be made as soon as possible, so as to form a guide to the present and possible users of hydrogen.

American Labour and Science

THE contrast between the policy of British Labour in restricting output to the pace of the slowest worker, and that of American Labour in increasing output to the fullest capacity, is illustrated, very much, we fear, to the disadvantage of the British labour party, in the manifesto on scientific research which the American Federation of Labour has just issued. The basis of American labour policy is "that a broad programme of scientific and technical research is of major importance to the national welfare, and should be fostered in every way by the Federal Government, and that the activities of the Government itself in such research should be adequately and generously supported." More valuable, however, than this conclusion itself are the grounds on which it is based, which we quote below :—

Scientific research and the technical application of the results of research form a fundamental basis upon which the development of our industries, manufacturing, agriculture, mining, and others must rest.

The productivity of industry is greatly increased by the technical application of the results of scientific research in physics, chemistry, biology, and geology, in engineering and agriculture, and in the related sciences; and the health and well-being not only of the workers but of the whole population as well, are dependent upon advances in medicine and sanitation; so that the value of scientific advancement to the welfare of the nation is many times greater than the cost of the necessary research.

The increased productivity of industry resulting from scientific research is a most potent factor in the ever-increasing struggle of the workers to raise their standard of living, and the importance of this factor must steadily increase since there is a limit beyond which the average standard of living of the whole population cannot progress by the usual methods of readjustment, which limit can be raised only by research and the utilisation of the results of research in industry.

There are numerous important and pressing problems of administration and regulation now faced by Federal, State, and local Governments, the wise solution of which depends upon scientific and technical research.

The war has brought home to all the nations engaged in it the overwhelming importance of science and technology to national welfare, whether in war or in peace, and not only is private initiative attempting to organise far-reaching research in these fields on a national scale, but in several countries governmental participation and support of such undertakings are already active.

If this document is at all representative of the spirit and intellectual outlook of American labour, we fear that British labour has a good deal to learn from the United States as to its responsibility for national welfare, as to the urgent need of increased productivity, and as to the part which scientific research promises to play in it.

Two New Bills

Two new Bills of considerable interest to British trade —the Patents and Designs Bill and the Trade Marks Bill—were read a second time in the House of Commons this week. From the statement made by Sir A. Geddes, it appears that the Government have done something to remove an admitted grievance on the part of patentees. With a view to compensating patentees whose patents have been held up during the war, the period of protection is to be extended from fourteen to sixteen years, with liberty to grant a further extension where a good case is made out. Other provisions of the measure aim at assisting the poor inventor who lacks the means of working an invention, and at remedying the system under which a foreign inventor may secure patent rights in this country without liability to manufacture here on a commercial scale. For the present we must accept Sir A. Geddes' cheerful claim that the new Bill will effect very substantial improvements in the law with regard to patents, and extend very much needed encouragement to inventors. The Trade Marks Bill aims, as its name implies, at the abolition of certain restrictions on trade marks, and Sir A. Geddes mentioned especially the case of "patent drugs." In some cases, he said, during the period of their existence the name had become the one practical description of them, and when the name became a trade mark they had got a permanent continuation of the patent protection. With regard to chemical substances, he referred to such a name as aspirin. It was to deal with the difficulties arising from the use of such names as absolutely blocking names upon other manufacturers of the same chemical substance that the second part of the Bill was brought forward. The Bill would effect considerable improvement in the present legislation governing the use and protection of trade marks.

The Chicago Chemical Exposition

THE Annual National Exposition of the Chemical Industries of America, which this year is to be held in Chicago during September, is expected to be larger and more representative than any of its predecessors. The number of exhibitors already exceeds those at the corresponding date of last year, and includes many new companies. Among the associations who are arranging for special sessions during the Exposition are the American Institute of Mining Engineers, the American Ceramic Society, the American Electrochemical Society, and the Technical Association of Pulp and Paper Industry, while the Chicago Section of the American Chemical Society will hold a series of meetings. A novelty will be the introduction of motion pictures for the illustration of some of the lectures. For example, after a conference on "Safety in Plant and Mine," there will be an exhibition of pictures, now being made in industrial plants throughout the United States under the supervision of Government officials, illustrating the latest devices for safeguarding the workers. The change from New York to Chicago is due to the conversion of the New York Exposition building into a hospital, and to the eagerness of the commercial organisations of Chicago to secure the Exposition with a view to developing interest in chemical industries. The official address for communications relating to the exposition is 417, South Dearborn Street, Chicago.

Recent Developments in Industrial Catalysis

By Dr. Hugh S. Taylor.

Dr. Taylor is Assistant Professor of Physical Chemistry at Princeton University, U.S.A. A native of St. Helens, he returned to this country during the war and devoted considerable time to the elucidation of many of the problems which confronted the Munitions Inventions Department. He has now returned to America, and sends us the following interesting article (which we propose to publish in two parts) dealing with the industrial use of catalysts, of which he has made a special study.

I.

THE development of applied catalysis has been most pronounced during the course of the present century. Prior to 1900, the lead chamber sulphuric acid process, the Deacon and Weldon mud chlorine processes were the most important examples of this branch of applied science. Since that date, industry has applied to its development the contact sulphuric acid process, the oxidation of ammonia, the hardening or hydrogenation of oils and fats and the synthesis of ammonia, whilst, at the same time, in numerous processes, the incidental operation of the catalytic agent has been elucidated and emphasised.

It is beyond the scope of an article to trace the progress of the science in all these varied directions. Rather must it serve to indicate certain of the broad principles which have been established and to trace out the more recent of such principles in the problems of catalysis which now occupy the attention of the chemist and of the chemical engineer.

The delicate nature of the catalytic agent had been learned in the preceding century. The sensitivity of a catalyst to poisoning agencies, even when these were present in minute amounts, was recognised as early as the existence of "the catalytic force," to employ the original nomenclature of Berzelius. Faraday's researches on the combination of hydrogen and oxygen at the surface of clean platinum voltameter electrodes established quite clearly the inhibiting effect of such substances as tap grease and carbon monoxide on the catalytic reaction. The sensitivity of the cuprous chloride catalyst in the Deacon chlorine process to moisture and to oxides of sulphur illustrated in the industrial field a like phenomenon, which became of paramount importance in the conversion of the contact sulphuric acid process to technical practice. Patented originally by Phillips, a Bristol vinegar merchant, in 1831, this process was tried out with ill-success in Lille in 1883; recognition of the necessity of pure gases prompted the method of operation adopted by Squire and Messel for the preparation of oleum, of utilising gases prepared from pure concentrated sulphuric acid, whilst using platinum as the contact agent. The oxidation of sulphur dioxide prepared from pyrites ores was not successfully attained until poisons such as arsenic, antimony, phosphorus and lead had been removed from the burner gases, and until freedom from dust and optical purity of the gases had been obtained. Hence, in the more recent developments of applied catalysis the operator has been fully alive to the effects of small traces of foreign materials in his reacting system, and, although their removal has presented continuously new and varied problems for solution, these have, in the main, been successfully solved. The operator of the modern technical unit makes of the catalyst poison his first care.

Effect of Promoters

Paralleling the negative catalytic influence which the earlier students of catalysis demonstrated in the presence of small amounts of catalytic poisons, the existence of a considerable positive catalytic effect exerted by small quantities of materials added to the catalytic agent proper, has been discovered and utilised in the more recent studies of catalysis in industry. This development has resulted in marked advance and improvement in technique and efficiency. To agents which, when added to catalysts, produce a large increase in catalytic acceleration, the term *promoters* has been given, and it is to such promoters that many processes owe their rapid and prominent advance. Thus, in the synthesis of ammonia the utility of the promoter is evidenced at every stage in the complete operation, in the preparation of the hydrogen, in the purification of the gas and in its subsequent combination with the hydrogen.

The function of the promoter in catalysis may well be exemplified in the textual quotation from a patent application of the Badische Anilin und Soda Fabrik for improvements in the preparation of hydrogen-rich gases from steam and water gas. This is accomplished by passage of the reacting mixture over a catalyst maintained at a temperature in the neighbourhood of 500° C., whereby, owing to the operation of the water-gas equilibrium, carbon monoxide and water vapour react to yield a product in which the bulk of the carbon monoxide has been converted to carbon dioxide with simultaneous production of hydrogen, equivalent in volume to that of the carbon monoxide disappearing.

$$H_2+CO+H_2O=CO_2+H_2.$$

The extract from the patent runs as follows:—

"In the researches on the production of hydrogen from mixtures of carbon monoxide and steam, according to the equation—

$$CO+H_2O=CO_2+H_2$$

we have found that the power of catalytic agents generally can be improved by the presence of certain bodies which may be termed PROMOTERS. We have found, for instance, that the activity of the catalytic agents, especially those consisting of or containing iron, or cobalt, or oxides thereof, and also the catalytic activity of other metals or oxides even such as, by themselves, are less active, can be greatly increased by the addition of certain compounds or bodies to which, as aforesaid, may be given the name promoters. Thus, the activity of catalytic agents consisting of or containing iron, nickel, or cobalt, or oxides thereof, can be greatly increased by the addition of oxygen compounds of chromium, thorium, uranium, beryllium, antimony, and the like. Further, a catalytic agent consisting of or containing iron in admixture with less than its weight of nickel, particularly after working for a long time, yields better results than does either iron or nickel when employed by itself. . . . In many cases, particularly when using catalysts of weak activity, we prefer to employ as promoter a compound which differs considerably from the catalytic agent, in particular with respect to valency, chemical basicity, and capability of reduction. . . . The contact masses containing iron, as the catalyst agent, and a smaller quantity of nickel, as above described as promoter, bring about rapid and far-reaching conversion without the simultaneous formation of methane, even when a comparatively low temperature is employed and, as compared with pure nickel, are further characterised (especially when suitable oxides or oxy-compounds are employed as binding agents, or as promoters) by possessing greater stability and less sensitiveness to deleterious influences such as, for instance, fortuitous increase of temperature and impurities in the gas mixture."

Experiments conducted by the writer have shown that the rate of reaction of water gas and steam under identical conditions of experiment, including temperature and velocity of passage is several times more rapid with calcined spathic iron ore which has been impregnated with a solution containing fifteen parts of chromium nitrate and eighty-five parts of iron nitrate, the impregnated mass being subsequently dried and ignited, than with a portion of the same calcined spathic ore which has not been thus treated. It will be readily apparent what such an improvement means from the standpoint of plant economy and economy of operation in the production of hydrogen rich gases from water gas and steam as raw materials.

Since the reaction is an equilibrium process, it follows that by this process of manufacture the hydrogen obtained will contain a certain percentage of carbon monoxide. Actually the economic balance in the process is such that the hydrogen obtained contains at least two per cent. of this impurity which, moreover, is a marked anti-catalyst in the synthesis of ammonia. Formerly, this impurity was removed by processes of absorpion at high pressures in aqueous caustic soda solutions at temperatures in the neighbourhood of 250° C., or in ammoniacal solutions of a cuprous salt of a weak acid. Indeed, the latter method of procedure is still being employed in German practice. The recent publication of Rideal and Taylor, however, indicates that the removal of carbon monoxide from hydrogen may be accomplished with the aid of a further catalytic reaction, capable of being conducted at ordinary pressures. These researches demonstrate that the relative reactivities of carbon monoxide and hydrogen with oxygen are conditioned by the contact agent in presence of which the oxidation is effected. Thus, in contact with reduced nickel, oxidation of the hydrogen occurs whilst in presence of oxide catalysts the reactivity of the carbon monoxide is the more pronounced. With suitable choice of contact agent it is possible so to adjust this preferential action that the carbon monoxide may be completely oxidised to carbon dioxide in presence of hydrogen without the simultaneous oxidation of more than negligible amounts of the hydrogen gas. Reactions of this type, preferential in nature, indicate of themselves the wide potentialities which the catalytic agent places at the disposal of future investigators of industrial problems. The researches, however, have an interest also in connection with the question of promoters here more particularly under discussion. For, as indicated in the same publication, it was there found that a mixture of two oxides acted more efficiently than a single oxide, whilst mixtures of two oxides with minimal quantities of a third oxide possessed marked advantages over a simple mixture of two oxides. Obviously here the promoter is acting to lower the temperature at which reaction occurs or in increasing the preferential nature of the catalyst for the carbon monoxide.

Catalytic Hydrogenation

In the synthesis of ammonia the most efficient catalytic agents are either prohibitively costly for industrial purposes, like the preparations of osmium, or are unduly sensitive to catalyst poisons, as is the case with uranium carbide. As a result, use has been made in industry of catalyst materials having, as their basis, reduced iron and with which are incorporated one or more substances acting as promoters. Thus, molybdenum, tungsten, cobalt and uranium have been included in a list of such promoters and it is known that a mixture of iron and molybdenum will function excellently as a catalyst, showing efficiently almost equal to that of uranium carbide whilst by no means so sensitive to certain catalyst poisons. The most recent reports credit the German plants with the use of reduced iron containing small traces of an alkali such as potash; the experimental investigation of which has been reported during the war by Maxted.

A further illustration of promoter action in applied catalysis is furnished by the most recent developments in the hardening of oils and fats by processes of catalytic hydrogenation. Since the discovery by Norman (B.P. 1515/1903) that hydrogenation could be accomplished in liquid systems by the use of reduced nickel, the technical processes operating have employed single metals as catalysts. In certain cases it has been claimed that the active agent was a sub-oxide. In the main, finely divided metallic nickel has found application, though works operating with the platinum metals as catalysts have been recorded. The recent patents of Dewar and Liebmann (U.S.P. Nos. 1,268,692 and 1,275,405 of 1918) assigned to the Procter and Gamble Co., of Cincinnati, Ohio, claim for a modification of the hydrogenation process by employing a mixed catalyst containing a plurality of heavy metal catalysts with or without a noble metal catalyst. As heavy metal catalysts, nickel, cobalt and copper are listed whilst as noble metal catalysts, palladium, platinum and silver are designated. Although silver and silver compounds have hitherto not been considered as catalysts, Dewar and Liebmann point out that they seem to exercise catalytic action. Promoter action, therefore, is distinctly indicated. Of the catalyst mixtures cited by way of examination, that produced from nickel and copper compounds was found to be the most economic. The mixed catalyst containing these constituents could be prepared by reduction of the mixed carbonates, hydrates or oxides derived from the nitrates either in the oil or before admixture with the oil. A ratio of nickel to copper equal to 10.1 was that cited in the specifications as most effective. Experience has shown that by employing such mixed catalysts two desiderata are achieved. The conversion of the unsatured oil to a hard fat by the addition of hydrogen to the molecule is very rapid at temperatures lower than are necessary in the case of single contact agents. Furthermore, the sensitivity of the catalyst to poisons is considerably less with the mixed metals, so that the purity of hydrogen demanded is by no means so considerable. With the conclusion of hostilities in Europe, the industrial development of this case of promoter action will rapidly be achieved.

Complex Catalysto

In the domain of ammonia oxidation to produce oxides of nitrogen for lead chamber sulphuric acid plants or for absorption in water and conversion to nitric acid or nitrates, the utilisation of promoters in connection with base metal catalysts has not, thus far, resulted in displacement of the multiple platinum gauze catalyst unit which has developed so remarkably in the last few years. Parson (*Journ. Ind. Eng. Chem.*, 1919, ii. 544) reviewing, in this connection, the activities of the U.S. Bureau of Mines, which organisation has completed the most comprehensive investigations of the non-platinum catalysts, reaches the following interesting conclusions. "After work with a large number of non-metallic catalysts and some metallic gauzes it was decided to confine further work to platinum. Other materials, while hastening the reduction, worked with a lower conversion of ammonia to nitric oxide. All non-metallic catalysts, although some showed high efficiency, involved such high cost for material and construction of apparatus, that their use was found to be impracticable." Similarly in the case of the contact sulphuric acid process finely divided platinum on some suitable support such as asbestos or dehydrated magnesium sulphate still maintains the field as industrial catalytic agent against many suggested base-metal catalysts admixed with promoters. Nevertheless, the field of promoter action is constantly extending, as is evidenced by the recent patent applications of F. Müller (Ger. Patent 207,385/1918) which, from the complex Werner compounds as starting points, claims for

the production of complex catalytic agents for various operations. The complex double salts are heated with exclusion of air at a temperature not exceeding that at which the catalyst is intended to be used. The heating may occur in a vacuum, in nitrogen, or in an atmosphere of the gases with which the product is to be employed as a catalyst. Thus, for synthetic ammonia catalysis a contact agent, prepared from potassium chromicyanide by heating at 300° C., was active at that temperature, and yielded 15 per cent. of ammonia at 120 atmospheres. Reaction time was not stated, but the result serves to indicate the possibilities open to experimental investigation of catalysts containing promoters with a view to securing the low temperature of operation desirable in this reaction. Sodium ammonium cobalticyanide gave a porous black catalyst on ignition, at 700° C., which also could be utilised for ammonia synthesis. Similarly for ammonia oxidation the product from luteochromium ferricyanide was active at 300° C.

The application of a catalyst obtained by heating croceo cobalt nitrate in nitrogen at 150° C. to the production of formaldehyde by fractional oxidation of methane at 150° C. is a result of distinct interest. Hitherto the industrial production of formaldehyde has employed methyl alcohol as the raw material, the conversion being effected by a process of catalytic dehydrogenation in presence of metallic copper, silver or suitable alloys of these metals coupled with the simultaneous oxidation of the hydrogen produced, by means of added air.

$$CH_3OH = HCHO + H_2$$
$$H_2 + \tfrac{1}{2}O_2 = H_2O.$$

The considerable quantities of formaldehyde which are now required for purposes of hardening of gelatine, preservation of food, disinfection, and for the synthetic phenol-formaldehyde condensation products (bakelite) utilised as hard-rubber substitutes for electrical insulation and other purposes, has led to the consideration of other methods of formaldehyde production. Glock, in 1898, patented the partial oxidation of methane to formaldehyde by the passage of a mixture of methane and air over granulated copper or pumice maintained at 800° C. The process was to be circulatory; the formaldehyde being removed by a system of scrubbers after each cycle. Bone and Wheeler, in their well-known experiments on the combustion of hydrocarbons, showed that a 20 per cent. yield of formaldehyde could be obtained by the flameless combustion of methane on a surface of boro-silicate glass beads. These methods, however, do not seem to have industrial applicability owing to the slowness of the operation and the consequent small yield per unit of plant, as well as to the difficulties associated with the control of the operation necessary in order to prevent the many non-productive side reactions which may readily occur. The catalyst prepared from the Werner salt, if operative efficiently at 150° C., would go far towards a solution of the problem of formaldehyde production from materials other than methyl alcohol.

It is of interest, whilst dealing with the question of aldehyde production, to record the corresponding production of acetaldehyde from ethyl alcohol by passage over suitably prepared copper at temperatures in the neighbourhood of 300° C. This process operates entirely as a dehydrogenation process and removal of the hydrogen by combustion with air is not requisite. The partially converted alcohol-aldehyde mixture is separated by fractionation, unchanged alcohol returns to the inlet system, the aldehyde is collected and hydrogen of reasonably high purity is obtained as a by-product. The dehydrogenation of borneol to yield camphor is a similar operation with a secondary alcohol, a ketone, therefore, being the resulting product. Hitherto, copper has been suggested as the contact agent. Müller suggests for the same purpose the product from hexaquochromi propionate.

Sodium Chloride and Blue-Powder Formation*

By Reginald S. Dean

It is common practice in zinc metallurgy to add small amounts of salt to the charge, which has been definitely found to reduce the amount of blue powder formed. No satisfactory explanation has been offered, however, for this action of sodium chloride.

The only text-book which discusses or even mentions the use of salt is Lodin, Metallurgie du Zinc (p. 163). The first patent granted for its use was that of Dony (French, December 7th, 1809), which called for a mixture of salt, chalk and potassium carbonate in the proportions of 1.4 per cent. of the weight of ore NaCl, 4.1 per cent. $CaCO_3$ and 0.2 per cent. K_2CO_3. Later practice has reduced the proportion of salt to 1 per cent. or less.

Volatilization of sodium chloride is evident from the first of the operation nearly to the end, and can be easily detected by the yellow flame. If the furnace is equipped with prolongs, a small amount of zinc chloride can frequently be found condensed in them, or if an excess of salt is added it is sometimes found in a layer of zinc chloride over the spelter.

Various hypotheses have been offered to explain the action of sodium chloride. These assume either a physical effect due to the entrainment of zinc vapour with the vapour of sodium chloride or a solution by the zinc chloride of any oxide coating formed on the condensed zinc particles. Although these may be contributing factors, the observations of Kiessling (*Berg. u. Hutt Ztg.*, 1903, p. 613) have shown that sodium carbonate acts similarly to the chloride, though perhaps not quite so effectively. Since sodium carbonate is non-volatile and no zinc chloride can be formed, we must look for other explanations. A hypothesis is offered here which, though not free from objections, offers a basis for rational development.

The formation of blue powder is due to a re-oxidation of the zinc by the carbon dioxide existing in the condenser according to the reversible reaction

$$ZnO + CO \rightleftharpoons Zn + CO_2$$

Researches by the American Zinc, Lead and Smelting Co. show quite conclusively that the percentage of carbon dioxide in equilibrium with a given mixture is greater at high than at low temperatures.

The presence of salt may be supposed to modify the reaction between ZnO and carbon thus:

$$2NaCl + ZnO + C \rightleftharpoons 2Na + ZnCl_2 + CO$$

The amount of sodium chloride which reacts in this way is only a small percentage of the whole, the principal portion volatilizing as such. If the amount of zinc chloride formed is not large, it escapes from the condenser unnoticed, since the blue zinc flame is masked by the yellow of sodium. It also collects to some extent in the blue powder that is formed. The metallic sodium being volatile, passes off with the zinc, and is the effective agent in reducing blue-powder formation, it does this by reducing the CO_2 content as the temperature falls, so that the sodium instead of the zinc is oxidized. Considering the two reactions,

$$2Na + CO_2 \rightleftharpoons Na_2O + CO$$
$$\frac{C^2_{Na} \times C_{CO_2}}{C_{CO}} = K'$$
$$Zn + CO_2 \rightleftharpoons ZnO + CO$$
$$\frac{C_{Zn} \times C_{CO_2}}{C_{CO}} = K''$$

K' is smaller than K'', and hence the sodium is oxidized and the zinc protected. Sodium carbonate would obviously effect the same result since the reaction

$$Na_2CO_3 + 2C \longrightarrow 2Na + 3CO$$

is known to proceed at fairly high temperatures. It has the advantage of being non-volatile and producing no zinc chloride, hence causing no zinc loss from this source. Sodium carbonate, however, tends to form slag, hence is objectionable. It should be noted that spelter made with the use of sodium chloride usually contains traces of metallic sodium, which can readily be detected by the flame test.

Thus a substance to be effective in reducing blue-powder formation must contain a volatile element more easily oxidized than zinc.

* From *Chemical and Metallurgical Engineering*, June 15, 1919.

Conditions in British Alkali Works*

Annual Report of the Chief Inspector

ACCORDING to the report, just issued, of the Chief Inspector under the Alkali, etc., Works Regulation Act, 1906, for the past year, the number of registered works in England, Ireland and Wales was 1,414, in 64 of which salt was decomposed with evolution of muriatic acid, defined in the Act as "Alkali Works." This total is the same as in 1917, but an increase of 21 on 1916. There are also 166 works in Scotland, making in all an aggregate for the United Kingdom of 1,580, as compared with 1,582 in 1917. Figures are given showing an increase of 26 processes under inspection as compared with 1917, and an increase of 99 as compared with 1916. There were fluctuations in various processes, but the chief increases were in smelting works, arsenic works, and works dealing with residual products from carbonisation of coal. These increases, however, were counterbalanced materially by decreases in several classes of works, of which the most numerous were associated with the production of materials used for munition purposes.

Chemists in Chemical Works

In the chapter on "Administration," Dr. T. Lewis Baily calls attention to the more extended employment of chemists in chemical works.

"The more extended employment of chemists," he writes, "in chemical works generally is a hopeful sign, though one regrets that repeated attempts at persuasion in this direction in past years received comparatively little notice; it seems to have needed the upheaval of war to bring about a realisation of the disadvantages under which so many works were carried on in days gone by, when manufacturers either would not employ chemists at all or would only have such men as had been trained in the works themselves for the special purposes of those particular works. One has heard so frequently the excuse that a university-trained chemist is useless in works—in such cases it seems to have been assumed that a man taken direct from the university should have been able to drop immediately, and without trouble, into the intricacies of a works laboratory and of works processes generally. There have been, undoubtedly, faults on both sides—on that of the university and that of the manufacturer. It is not desirable that educational institutions should attempt to train chemists simply and solely on a technical basis; the student should surely be given first a good sound scientific training, with a sufficiency of laboratory work to make him a painstaking and accurate manipulator, irrespective of the time taken to arrive at his results; then, and then only, should he be taught to adapt himself to questions of time-saving and shortened or rapid methods, coupled with the degree of accuracy desired for the end in view. He will then appreciate truly the evolution of technical methods necessary for the rapid control of the results of manufacturing operations.

"But training on either the one or the other of these lines only is surely insufficient to produce the character required for a satisfactory and successful works chemist, who may be required to take his place in ever-varying branches of the industry. Further, when the manufacturer gets the product of this training, he still must not expect to have a man who can at once take his place under technical conditions, of which he cannot possibly know all the details; the manufacturer must now take up and complete the training, and ascertain what is the adaptability of the man in question. Some quite naturally become leaders of men, and so can in a short time be led on from the laboratory to process and even works management, in which, be it remembered, thorough knowledge of scientific principles is a necessity for the development and extension of the processes of manufacture—there is no finality and there can be no standing still. Others, again, have little ability as men-leaders, but they may be excellent investigators, and as such particularly suitable in other departments of a works which aims at being progressive.

"Simple process testers there will always be, but these are quite apart from the guiding hands, and have no effect on development. May the near future see this all-important question take its proper place as one for serious consideration in all works where there is any pretension to permanency.

"At this time," the chief inspector adds, "increased national production is more urgent than ever before as essential for national prosperity. Three of the chief supports on which such prosperity will rest are efficient labour, scientific control, and co-operative effort."

Alkali and Copper (Wet Process) Works

Seventy-one chimneys and final outlets were tested for muriatic acid in gases, and the average escape for 1918 was 0.076 grains per cubic foot, against 0.089 in 1917. This figure is well within the limit of 0.20 grain fixed by the Act, and compares with 0.089 grain in 1917. The district averages varied between the maximum of 0.101 grain and the minimum of 0.030 grain per cubic foot. In no case was it deemed necessary to initiate proceedings to enforce the penalty incurred by emission of an undue proportion of muriatic acid, but in one case, where a temporary cessation of testing the chimney gases led to an undue escape being unknown to the management, warning was given as to the necessity of maintaining efficiency in this respect. In the past this work has been the subject of repeated complaint, but with increased draught on the furnaces and better general conditions much improvement has been effected.

The development of electrolytic methods for producing alkali and chlorine was very considerable. Through the influence of the ammonia-soda and electrolytic processes the operation of the Leblanc process was materially curtailed towards the end of the year. The outlook is that this process, which has held the field for so many years, must, as regards the manufacture of alkali, yield to that combination of the two newer methods which will supply the market with the desired quantities of alkaline and acidic products. Already the change has been made in several alkali works in more than one centre of the industry, and is accompanied by working conditions much less liable to cause an emission of noxious gases, as the evolution of these in the course of manufacturing operations is very greatly lessened. The demand for hydrochloric acid and salt-cake will still cause the decomposition of common salt with sulphuric acid, but to a much smaller degree, and distributed more widely throughout the country in works of smaller individual magnitude.

Cement Works

The number of this class of works was one greater than in 1917. This industry, like most others, suffered from war conditions, and the output was much below the full capacity of the available plant. Repairs to machinery and general upkeep fell into arrears. So, much requires to be done before a maximum output can be reached.

The question of potash recovery from kiln fume continued under consideration, but little definite progress of a practical character can be reported. During 1918, as in previous years, considerable quantities of the heavier particles were deposited in flues and were utilised for agricultural purposes, but much of the finer particles still escape. The question of potash recovery generally is under special attention, and much progress has been made in connection with industries other than cement manufacture which offer a more attractive field for effort.

Smelting Works

The number of this class of works was 83, an increase of seven over the total for 1917. This increase was largely due to new registrations in District VI, which includes the highly mineralised counties of Devon and Cornwall. The general average acidity of the chimney gases discharged from smelting works was slightly less than in 1917. This was due to a marked decrease in this acidity in all districts except VIA and VII. In District VII the number of such works is small, whilst the increase in acidity was not great. In District VIA, however, very different conditions existed, where the excessive proportion of sulphurous gases sent

* Fifty-fifth Annual Report on Alkali, etc., Works, by the Chief Inspector. Proceedings during the year 1918. H.M. Stationery Office. 2/-.

into the air from the roasting of ores containing sulphide of zinc materially affected the average for the whole country, and induced a district average in marked contrast to all the other district averages. This calcination of zinc sulphide ores accompanied by discharge into the atmosphere of all the acid gases formed by the combustion of the large proportion of sulphur in these ores continued in far too many cases. The manufacture of sulphuric acid from the sulphurous acid obtained in a sufficiently concentrated form where these ores are calcined in furnaces of suitable design has an established standing in this country. It is undesirable that the calcination of these ores should be continued any longer than is absolutely necessary in those furnaces which, indeed, prepare the ores for the subsequent extraction of zinc, but disregard entirely the condensation and utilisation of the sulphur acids formed at the same time. This is a form of atmospheric pollution which is preventible by means which achieve other advantage than a diminution of discharge of noxious gases of great prejudice to the locality in which such operations are carried on.

The use of sulphide ores other than those of zinc was materially less during the year, owing to a more limited available supply. This was due, in part, to the development of methods for treating ores at mines in other countries, thus leaving less to be done in those works where ores were used imported in their natural condition.

The deposition of fumes continued to receive attention. Mechanical methods continued in successful operation, whilst electrical methods extended, both as regards the scale of operations in those works where these methods were previously in use and as regards the number of works in which they have been adopted.

Sulphuric Acid Works

The number of this class of works registered was 146, a decrease of one from 1917.

Average Escapes of Acid Gases from the Lead Chamber Process

The reduction in acidity of discharged gases was very general; only in two districts was there a slight increase, but the variation was not of marked degree in any instance.. The year was one of anxiety to owners of this class of works. The large increase in productive capacity in works specially erected to meet the abnormal war requirements eased the heavy pressure which was in evidence previously, whilst the conclusion of the Armistice profoundly affected the aggregate production of sulphuric acid. New plants erected on modern lines were not put into operation, several plants already in operation were stopped, and certain others ceased operation owing to destruction by fire. The easing of pressure for urgent delivery of acid from the older plants permitted of greater opportunity for temporary stoppage for repairs in many cases, but difficulties regarding labour and material were obstacles to rapid progress, causing much delay and hindering work which would otherwise have been undertaken. Still, extensive repairs were effected and improvements carried out in many works, so that the general condition of working plant throughout the country was materially improved. Certain works which previously were cause of anxiety were put into much better condition.

The various types of plant for the " chamber " process continued in operation. Those of the newer designs calculated to work with limited chamber space continued to give satisfaction. There were also instances where a combination of the newer with the older type was in use. It is, however, open to discussion whether it is wise to combine two systems which differ in fundamental characteristics. In the report for 1917 reference was made to the wide variation in the time factor in an Opl plant as compared with a chamber plant, the figures being 12.3 minutes for the former, and 144 minutes for the latter. At the time the measurements of duration of reaction were made the chamber spaces were approximately 1¼ cubic foot and 16 cubic feet per lb. of S. burned per 24 hours, a ratio which is almost the same as that of the time observed.

In the Mills-Packard system the chamber space varies from 3.6 to 4.5 cubic feet, so that, if the direct relationship be general, the time required in this system for completion of the chamber reactions should be something of the order of fifty to forty minutes.

One of the prime factors governing the speed of conversion of sulphurous into sulphuric acid in the chamber process is the ratio between the sulphurous and the nitrous gases in process; but a ratio which is suitable for a time period of forty minutes is less suitable for a period of 120 minutes. It would seem that if the gas composition is adjusted to suit the small chamber space section of such a compound unit it will be too nitrous for the other section, and more rapid corrosion of lead may be looked for. If, on the other hand, the gas composition is adapted to the large chamber space section the nitrous gases will be too low in proportion to ensure that rapid make and condensation of sulphuric acid which is the feature of the small chamber space section. An intermediate gas mixture is not calculated to elicit the best results from either section.

The more thorough system of control of the chamber process by a more complete examination of the composition of the gases in process at successive points of the plant did not come into use to any great extent. This is to be regretted, as it is only by careful study of detailed working results that higher standards of efficiency are to be hoped for or advance made in working methods.

The use of nitrous gases produced by the oxidation of ammonia by catalytic influence, in place of nitrous gases produced in the customary way by the decomposition of nitrate of soda with sulphuric acid, continued to give much satisfaction in those works where it was in operation. The operation of this method was considerably extended, both by its adoption on a larger scale where it had already been in use and by its introduction to many other works where the ordinary system had been alone relied upon. As experience is acquired its facility of control and uniformity of operation are the more recognised. It is also stated to be the less costly, but this aspect will be dependent upon the relative cost at the works of the raw materials used, whilst other factors will have an influence on the future comparative development of the two methods in vitriol chamber practice.

The preliminary oxide of iron contact towers erected between the burners and the Glover tower were under trial in several works, but did not give such good results as were anticipated. This disappointing experience was due to a variety of influences. In some works the device was attached to burners using spent oxide, but the dust accompanying the burner gases was too much, and the choking of the tower interfered with the draught necessary for effective working. At one work the movement of the chamber gases, induced by a chimney with feeble draught, was already at a minimum, so that the increased resistance of the additional tower likewise led to unsatisfactory working of the chamber process. At another work faulty construction caused failure for the time being. Less progress was thus made than was at one time expected, but there is no reason to anticipate that success will not reward persevering effort to overcome obstacles which, after all, are of a secondary character.

The trouble caused by dust carried forward with the burner bases continued as in past years to be prominent, and received much attention. Some of the difficulties just referred to in the trial of preliminary oxide of iron contact towers were associated with the hope that a simultaneous removal of this dust might be effected. A modification recently introduced continued to give satisfaction. It consists in removing part of the dust in depositing flues, in subsequently cooling, washing, and filtering the burner gases for further removal of dust and for removal of other impurities somewhat after the procedure followed in preparing similar gases for use in contact processes, then by pre-heating the cooled purified gases in a heat interchange chamber by utilising hot gases leaving the burners, and by finally heating the gases by aid of fuel to cause the gases to enter the Glover tower at the desired temperature for the usual chamber practice. This entails a somewhat more elaborate plant and an increased fuel consumption, but the advantages secured by the production of a high-grade acid and more regular work are distinct.

Zinc blende continued to be the source of sulphur used successfully in a small number of works for the manufacture of sulphuric acid by both the chamber and contact processes. The type of furnace in use varied in different works, mechanical as well as hand-worked types being in operation.

Mr. Sutton, in his report upon District VII, refers to a burner for spent oxide, automatic in character but devoid of moving parts, in the following terms:—" The furnace consists of a circular brick structure about 20 feet high with internal spiral flues, the inclination of which is adjusted at various points in such a way as to ensure a continuous and even flow of the oxide material by gravitation only. The oxide is fed in at the top continuously by chain feed. The experimental furnace had one flue only, and has worked (with stoppages to perfect the inclination of the spiral) for nearly two years. The furnace is now being reconstructed to have three internal flues, and it is expected to be capable of dealing with 6 to 8 tons of oxide per diem."

(*To be continued*)

Trade With Central Powers

A WHITE Paper (Cmd. 274) has been issued by the Board of Trade relating to trading conditions as affected by the raising of the blockade and the authorization of the resumption of trade with Germany and other countries. The White Paper states that with the conclusion of Peace with Germany the necessity for the prohibition of trading with the enemy has ceased. It may be expected that there will be a considerable demand in Germany for all kinds of goods, and with the raising of the blockade this market will be open to all the world. It is no part of the policy of the Government to discourage British traders from competing in this market. It is necessary in the interests of this country to develop the export trade to the fullest possible extent in every direction, and it is very desirable that British traders should at once make every effort to secure a proper footing in Central Europe.

Germany

Any goods may be sent to Germany without licence, except goods on lists "A" and "B" of prohibited exports. Applications for export licences in respect of goods included in these lists should be addressed to the Export Licence Department, 1, Queen Anne's Gate Buildings, Westminster, S.W. 1. Goods sent to the occupied Rhineland through Holland need no longer be consigned to the Standard Bank of South Africa at Rotterdam. Any goods may be imported from Germany, and paid for without licence, except goods whose importation from all foreign countries is prohibited either by virtue of Acts and Regulations in force before the war or of Proclamations issued since its commencement. Goods prohibited by a Prohibition of Import Proclamation in respect of which a general licence has been issued may be imported from Germany, but individual licences issued under the Prohibition of Import Proclamations are not available for goods of German origin. A list of import prohibited goods was given in the *Board of Trade Journal* of June 5, 1919, and additions to and variations in the list have appeared in subsequent issues of the journal.

Other transactions of a commercial or financial nature with firms in Germany are permissible without further licence, provided they do not involve any of the following matters, namely: (*a*) the payment of money arising out of pre-war transactions; (*b*) the delivery of or dealing with property held in this country for persons in Germany since the outbreak of war; (*c*) the transfer of securities by or on behalf of a person in Germany; (*d*) the allotment or transfer of securities issued by a company to or for the benefit of a German subject; (*e*) the transfer of any debt or other obligation due to a person in Germany.

Austro-Hungarian Dominions

In regard to Austria, the conditions are the same as those which apply to Germany, except that List "D" applies in the case of exports to Austria. The resumption of trade with Hungary has not yet been authorised, except in the case of those parts which are in Allied occupation or are included in the newly constituted States. In other territories formerly part of the Austro-Hungarian Dominions, individual import licences issued under the Prohibition of Import Proclamations by the Department of Import Restrictions, 22, Carlisle Place, S.W. 1, will be available for goods produced in these territories. In other respects the conditions set out above in the case of Germany apply except that List "D" applies to exports to Jugo-Slavia.

Turkey and Bulgaria

Except that individual import licences issued by the Department of Import Restrictions are available for goods produced in these countries, and that List "D" of prohibited exports applies to Turkey and Lists "D" and "E" to Bulgaria, the conditions are the same as for Germany.

Neutral Countries

It is no longer necessary to obtain certificates from importing associations in Norway, Sweden, Denmark, Holland, and Switzerland, or to procure other forms of guarantee, or to consign goods to such associations. Export licences, for which application should be made to the Export Licence Department at the address given above, are required only for goods on Lists "A" and "B" of prohibited exports. Import licences must be obtained from the Department of Import Restrictions for goods which are prohibited to be imported into the United Kingdom under the Prohibition of Import Proclamations.

With regard to Poland, Finland, Esthonia, Lettland, Lithuania, there are no special restrictions on trade, but, as in the case of other foreign countries, export licences are required for goods on Lists "A" and "B" and import licences for goods subject to the Prohibition of Import Proclamations. Further information regarding the export of goods to the above and other countries will be found in the "List of Export Prohibited Goods," which is published fortnightly by the Export Licence Department of the Board of Trade, 1, Queen Anne's Gate Buildings, Westminster, S.W. 1. Information with regard to import licences may be obtained from the Import Restrictions Department of the Board of Trade, 22, Carlisle Place, S.W. 1.

Consular certificates of origin and interest are no longer required for goods imported into this country, and declarations of ultimate destination and disclosure of names of consignees will no longer be required to be made in respect of exports from the United Kingdom, and disclosure of the name of the consignee on bills of lading or shipping manifests is unnecessary, except in a limited number of cases where the Export Licence Department may continue to specify on an export licence the name of the consignee.

Prohibitions Still in Force

The raising of the blockade does not affect:—(1) Defence of the Realm Regulation 41D, which prohibits except under licence from the Treasury remittances out of the United Kingdom for the purpose of making or subscribing to any loan or subscribing to any issue of capital outside the United Kingdom; or purchasing any stock, shares, or other securities, or any property other than merchandise, if the securities or property are not in the United Kingdom; or purchasing any foreign currency to be held with a view to appreciation in value or as an investment; (2) the Prohibition of Import Proclamation No. 21 of 1917, which prohibits the importation of bonds, debentures, stock or share certificates, scrip and other documents of title relating to any stocks, shares, or other securities, with the exception of matured bonds redeemable in the United Kingdom and coupons falling due for payment in the United Kingdom; or (3) Defence of the Realm Regulation 30F, which prohibits *inter alia* the purchase or sale of stock, shares, or other securities which have at any time since September 30, 1914, been in physical possession outside the United Kingdom.

The King's Call to the Nation

IN the course of his reply to an address from the Corporation of London at the Guildhall on Tuesday the King made a notable appeal for unity in the interests of British trade.

One of the most important tasks before us, he said, is the restoration of our overseas trade. The re-creation of our Merchant Navy and the development of our ports must be pursued with the utmost energy if we are to regain our old supremacy. I am glad, therefore, to learn that the Port of London Authority is sparing no effort to attain that end. By enlarging the system of docks, adapting them to the conditions of modern trade, deepening the river channels, adding to the facilities for storage, they are expanding their work in every direction. I recognise the great services which the resources of the Port have rendered during the last five years, and I trust that the growth of its trade, so marked in the past, may continue in increasing measure now that the seas are once more free to peaceful commerce.

With the end of the war a great chapter in the history of our country is closed. The new era which is opening before us brings its own tasks, and the same qualities which have carried us to victory will be needed in full measure for the work of reconstruction. The spirit of union, self-sacrifice, and patience which our people displayed during the years of fighting will still be required if we are to reap the full benefit of the peace which we have won; and these great qualities must be reinforced by the homelier virtues of industry and thrift.

As was inevitable in the prosecution of the war, we have been living largely on our capital. Now that we are at peace again, our country urgently demands from every citizen the utmost economy in order to make the best use of the resources which the nation possesses, and strenuous and unremitting industry in order to ensure the greatest possible production of necessary commodities. Without these we shall have to face depression and poverty. Without these we cannot hope to maintain the high position in the industrial and commercial world which we held before the war.

I am confident that the ancient and sterling virtues of the British people will not fail us in the hour of need; and I join with you in praying that the Divine Providence which has guided us through the war may continue to guide our deliberations and inspire our hearts so that we may be enabled to make a worthy use of the victory which has been given to us and to our Allies.

Mond Nickel Company's War Work

The Increasing Demand for Nickel

At the annual meeting of the Mond Nickel Co. (Ltd.) the chairman (Mr. Robert Mond) referred to the work of the Company during the war.

Nickel, he said, both in the pure state and alloyed with iron or copper or chromium, has formed an essential constituent to munitions of war, such as armour plates, guns, cartridges and bullet casings, and has been largely used in the engines and tools necessary for their construction. Your directors from the very first day of the war fully realized the important part nickel would play, and at once placed the whole of the output at the disposal of the Government, and took immediate steps to increase the production as rapidly as possible. In spite of the difficulties both of obtaining labour and material, they were able to double the output between 1914 and 1917, and if it had not been for the exceptional difficulties of obtaining further labour and material, the plant for trebling the pre-war output would have been completed. We were controlled under the Munitions of War Act, and were granted a high priority for materials we required. Without this assistance the progress we have made would have been impossible. In Canada we encountered the same difficulties—perhaps even to a greater degree—and it was due to the unremitting efforts of our colleague, Mr. Corless, and his staff that the development and manufacture in Canada was fully maintained and that our requirements here were more than met. The difficulties of the shipping situation due both to the losses by submarines and the general scarcity of freight, induced your directors to provide a reserve of Bessemer Matte in this country to meet eventualities.

The make of our other main product—copper sulphate—which we produce in the same proportion as the nickel, was also doubled during the war. It is, as you know, chiefly used for agricultural purposes, and during the last two years your company has worked in close co-operation with the Board of Agriculture and the Food Production Department with a view of educating farmers and other growers of those foodstuffs which we were so badly in need of with the importance of spraying their potatoes and other crops, as spraying with copper sulphate increases the growth and prevents the diminution of the harvest by blight and other plant diseases. Our research staff collaborated with the Food Production Department, and as the growers experienced considerable difficulty in properly making spraying mixtures for themselves, we are pleased to say that we have been able to elaborate, as a result of a lengthy chemical research, a mixture which we have registered under the trade name of "Blighty," which requires only dissolving in the requisite quantity of water to form the best spraying mixture. Although we have only recently introduced this new article on the market, we are satisfied with the progress it has made. We also produce a proportion of our nickel in the form of nickel sulphate and nickel ammonium sulphate, which are chiefly used for fat-hardening and nickel plating.

Nickel steel is not only used for armour plate, but also for engineering purposes, bridge-building, motor-car industry, aeroplanes, &c., and I anticipate that there will be an increasing demand in that direction in the future. I also believe that the various countries, possibly even this country, will more and more adopt nickel for coinage purposes. There is also evidence that on the Continent most of the nickel coins have been converted to other uses during the war owing to the great scarcity of nickel. These will require replacing. The use of nickel in the manufacture of useful domestic utensils, such as cookers, forks and spoons, coffee-pots, &c., is as yet only in its infancy, and there is room for considerable development in this direction, particularly in this country. Your directors have acquired a rolling mill in Birmingham, which was constructed during the war, in order to enable the company to convert some of its finished nickel into other forms so as to compete with Continental manufacturers. As you are all aware, your mines contain about the same amount of copper as of nickel, which copper is turned into copper sulphate. Owing to the war, heavy stocks of this product have also been accumulated by the Governments of the vine-growing countries, where this product is used in large quantities. These Governments, therefore, decided during the last year to impose import restrictions, which are now being removed. We now anticipate that most of these stocks will be used up during the present season, and then we may expect that the normal trade will be resumed. The final residues of our refining process contain appreciable quantities of precious metals. As regards these, we have lately started our own refinery, and I have no doubt that this will be an additional source of revenue to the Company.

In common with other manufacturing concerns throughout the world, their cost of production had been immensely increased in the course of the war. In Canada, the cost of mining and of the production of Matte had practically doubled, and at their works in South Wales the wages of their processman had risen by 180 per cent. to 213 per cent.; the wages of the tradesmen on shift work had increased by 187 per cent., and of the day labourers by 142 per cent. The cost of coal had more than doubled, and that of sulphuric acid, which next to coal was their most important raw material, had increased by more than 170 per cent. Timber had increased by 400 per cent., steel work by 180 per cent., bags by 190 per cent., and casks by 170 per cent. In spite of this large increase in the cost of production they had succeeded in selling nickel during this war to the Government at only comparatively slight advances over pre-war prices. The balance carried forward to Profit and Loss Account was £320,428, as compared with £531,845 for the previous year. The directors had already distributed £34,300, being the half-yearly dividend on the old Preference Capital, and £45,000 Interim Dividend on the Ordinary Capital of 1s. per share, making, therefore, a total of £79,300. They now proposed to allocate the balance as follows:—£34,300, half-yearly dividend on the old Preference Capital, subject to deduction of income-tax; £28,500, dividend on the new Preference Capital at the rate of 7 per cent. per annum, subject to deduction of income-tax; and £112,500, dividend on the Ordinary Capital at the rate of 2s. 6d. per share free of income-tax. These amounts made a total distribution in the shape of dividends on the Preference and Ordinary shares of £254,000, leaving a balance of £168,058 6s. 1d., which the directors proposed to carry forward.

The report and accounts were unanimously adopted.

According to *Stubb's Weekly Gazette*, the failures in the United Kingdom for the week ended July 26 were 18, a decrease of five. The number of bills of sale registered and re-registered was 83, an increase of 31. Mortgages and charges registered by limited companies amounted to £1,583,250, the amount authorised (where stated) being £381,580.

Officials of the United States Government are considering a proposal to summon a conference of representatives of Great Britain, France, Italy, the United States, Switzerland, and other countries for the purposes of determining the kind, quantity, and prices of dyes to be taken from Germany under the terms of the Peace Treaty. It is proposed that each delegation shall be composed of one representative of the dye-making industry, one representative of dye consumers, and one impartial business man.

The Trustees of the Beit Fellowships for Scientific Research have elected Mr. Jonas Arthur Hey to a Fellowship. Mr. Hey was educated at the Keighley Trade and Grammar School, 1907-14, and has been a student at the Imperial College of Science and Technology since, except during the period of his war service. He obtained the Associateship of the Royal College of Science and the B.Sc. degree (with second-class honours in physics) of the University of London in 1916. Mr. Hey will carry out his research at the Imperial College at South Kensington.

During the war a large number of women were trained as routine assistants in factory laboratories at the Technical Schools of Birmingham. This course was decided upon because of the withdrawal of industrial chemists of military age. The Education Committee report that many well-educated girls underwent training, which was framed after consultation with midlands works chemists. The results have, it is stated, been most satisfactory. At one time there were thirty girls in training, and situations have been found for all who went through the course.

Professors MacLaurin (Chemistry), Mackay (Political Science), Hogg (Physice), and Mr Greenway, Director of Agricultural Extension, have been asked by the Board of Governors to retire from the service of the University of Saskatchewan. The professors are demanding an explanation.

Dealings in Shell Transport and Trading Company Ordinary shares of £1 each, fully-paid Nos. 8,109,072 to 12,164,287 have been specially allowed by the Stock Exchange Committee under Temporary Regulation 1 (3).

Arrangements are being made for the erection of chemical works at Holmes, Selby. It is stated that the proprietors are a Swiss firm and that eau de cologne will be one of the principal products.

Some Chemical Firms' War Work.

[From our Runcorn Correspondent].

The chemical works in the Runcorn district accomplished wonderful work during the war period. The staff of the Castner Kellner Co., worked splendidly with the magnificent plant at its disposal, to counter the German "mystery gas" attacks. So far back as 1911, a decision was arrived at by the Castner Kellner management to increase the plant, and, by a stroke of fortune, the extensions were nearly complete in July, 1914 A much greater increase than that previously decided upon was rendered necessary by the conditions that arose then. Up to that time, it is understood, the only British plant arranged for the production of liquid chlorine—the basis of all the offensive poison gases—existed at Castner's works. This had been in intermittent operation for a year or two before the war, and the output was only about one ton a day, as the home demand for the product was small; although liquid chlorine was then being largely utilised in Germany in bleaching and dyeing processes. Immediately the war broke out, the demand for chemicals increased enormously, while a difficulty over supply was created by the number of men who had joined the forces, causing shortage of labour. The company were able, however, to maintain their output, and to increase it. In 1915, when the enemy first used poison gas, Castners were called upon to meet the need. The response was prompt, and, within six weeks, production of liquid chlorine was increased from one ton per day to half a ton per hour; and, in ten weeks, to one ton per hour. The Weston Point (Runcorn) works was the main source of gas supply for the English, French, and Russian armies, and a partial source of the Italian army supply.

Nearly every form of new material was tried at the Castner Kellner works experimentally, and the first considerable quantity of "Mustard gas" used by the Allies was produced there. During the whole course of their operations no man lost his life, nor was there a case of serious injury. Having regard to the great danger of the experimental work so courageously carried on, this is a wonderful record, and a tribute to the care and watchfulness of both the employees and the management. It is interesting to note that about 150 women were employed on gas production.

The Castner Kellner works have also produced large quantities of permanganate of soda, utilised for the filling of the gas masks, which enabled the victorious armies to resist attacks. This was also made by an improvised plant, which worked satisfactorily to the end. The British Army is also indebted to the Weston Point Works for hydrogen gas, which has been supplied in large quantities right through the war. The R 34 was filled with Castner's gas for her memorable journey across the Atlantic.

Valuable war work has also been performed at the Wigg Works of the United Alkali Co. Just before the outbreak of hostilities, substantial extensions and reconstructions were in progress, but were set aside to meet the national war demand. The extensive acid plant was used for providing vitriol for high explosives, and played a great part in the early days, when there was a shortage. It was worked with such intensity during the crisis, that portions of it collapsed under the strain. The fertilising plant—one of the largest in the country—was placed at the disposal of the Board of Agriculture, and has done great service in producing those extra crops of foodstuffs on which the nation depended. The metal works have been pressed to the limit of their capacity, producing copper and iron ore for steelmaking, essential for munitions. The carbon bisulphide and other plants, have all been working at high pressure to meet war demands. Not an hour of labour, nor an ounce of material has been used for any purpose save the all-essential one of winning the war. In carrying out this programme, necessary repairs and essential extensions have been sacrificed to the great purpose of serving the nation.

At the Salt Union's Weston Point Works, the process of purifying crude sodium nitrate, utilised for making high explosives, was undertaken on a large scale, the existing plant being adapted, and a great deal of new plant erected for the purpose. Almost countless thousands of tons of the crude material was dealt with. The shortage-of-labour problem was overcome by the engagement of women, about 300 being employed at one period. The process was kept going day and night, weekday and Sunday, and the girl workers, for whose care and comfort special arrangements were made, undertook work of a comparatively heavy character, and "stuck it" very pluckily to the end.

A New Coal-Carbonising Process

In an interesting letter to the *Times* on the carbonisation of coal, Lieut.-Colonel Herman Clarke (late Assistant Director of Inland Waterways and Docks) writes:—

Of the coals consumed commercially and domestically under the present conditions a very large proportion are high volatile coking coals, and these must be considered in the economic position, for the reason that they cannot be used for metallurgical coke making owing to the quantity being largely in excess of the requirements of that industry. The problem, therefore, is to treat these coking coals, which are at present wastefully and uneconomically burnt in the ordinary open grate or cooking range, in such a manner as to obtain: (*a*) A smokeless coke suitable for commercial and domestic use; (*b*) at the same time recover the extremely valuable by-products—*e.g.*, motor spirits, fuel oils, ammonia, &c.

A great deal of money and research has been devoted in Great Britain to the attainment of this end, but so far none of the systems has commercially been successful, for two reasons:—(1) The difficulty of designing retorts which under the low temperature essential to the process could carbonise a sufficient quantity of coal to be commercially profitable in a commercially economic length of time. (2) Because the fuel produced has been so friable and soft that it would not bear the necessary handling, screening, and delivery from the ovens to the consumer.

This position is well recognised by both scientific inquiry and by the result of the attempts to carry out the process commercially. The problem resolves itself, therefore, into creating some method whereby coal carbonised can be coked within a commercially profitable length of time, and at the same time the fuel produced be of sufficiently dense and hard a character as will stand transportation, screening, and handling.

A New Process

Prior to the war, and since demobilisation, I have, in connection with Dr. Harold G. Colman, D.Sc., Ph.D. (who is recognised as one of the leading technical coal-carbonising experts of the country), gone very carefully into all the conditions surrounding the carbonising of coal at a low temperature, and in connection with our examinations and studies we, in March of this year, went to the United States and made a thorough and careful investigation into the operations of a continuous horizontal coke oven, which has been in successful commercial operation in America for the last five years. The basic principle of this oven is its continuous operation, brought about by the action of a reciprocating floor, which by its movement longitudinally in the oven automatically discharges the coke from one end, and draws the coal from the bunker at the other. At the same time, owing to the pressure set up within the oven itself by the action of the floor, a very heavy compression of the plastic coal takes place, with the result that the fuel produced is of a hard, dense, and uniform structure, which can be handled and transported without undue loss by disintegration.

The commercial operations of the oven have clearly demonstrated that:—

1. Because, partly owing to the operation being continuous and partly to the design of the oven and the heating arrangements adopted, a more rapid carbonisation of coal is effected than is obtainable in any intermittent process, and it becomes possible to carbonise within a commercial period of time and with a moderate fuel consumption for heating.

2. Because the pressure set up by the action of the reciprocating floor compresses the coal within the retort when plastic so as to produce a fuel which is not only free-burning and smokeless, but sufficiently hard to meet the commercial requirements of transportation.

3. Because, owing to the continuous character of the operations, the operating costs of labour are very much less than in any other plant of this kind.

4. Because the carbonising conditions brought about by the continuous working are those most favourable to a high yield of by-products, especially for obtaining a maximum amount of light hydro-carbons from the coal, suitable for motor spirit and also for the heavy fuel oils.

The oven is patented in Great Britain by Mr. L. L. Summers, the inventor, and a plant is now being constructed for demonstration purposes in the United Kingdom. As Professor Bone states, the carbonisation of coal at low temperature is technically

possible, but heretofore has been commercially unsuccessful. I am, however, convinced, from my study of results and my examination of the operations of the Summers system, that the difficulties of the process will be overcome, and that, both technically and commercially, a solution of the problem has been arrived at.

Photographic Research in England

Dr. R. E. Slade, the Director of Research of the British Photographic Research Association, in his report for the past year, states that a wide programme of research has been drawn up and preliminary experiments made on a large number of subjects.

The history of photographic science and industrial development shows, the report states, that since the publication in 1891 of the researches of Hurter and Driffield, practically no new methods of attacking the problems of photography have been introduced. Many workers have improved and worked out further details of the old-established methods, and very considerable advances have been made, but the time now seems ripe for entirely new methods of photographic research. The Association is using all the means at its disposal to initiate such new methods, and is making progress in that direction.

We are attacking problems by investigating the fundamental principles by any or all of the latest scientific methods. We do not generally make use of empirical methods guided by scientific knowledge, because this is what is being done in the factories, and the factories are in a better position to do this than we are. It is, indeed, by these empirical methods that the photographic industry has obtained its present excellent position. We believe, however, that we are taking a long-sighted view, and that we shall open up new fields in which we shall use all the methods we can, including empirical methods to get results of technical and industrial value.

We have made some experiments on gelatin, which though not suitable for publication will be of great use to us in future work. Progress has been made in our investigations of photographic emulsions, and we shall shortly have a communication on this subject to circulate to members.

New Wood Staining Process

We have succeeded in staining wood black or grey right through. This black wood, which was made in Germany before the war, is used by manufacturers of cameras and optical instruments, and the grey wood is used for picture frames and furniture. Our process, for which an application for a patent has been filed, should be quite suitable for use on a large scale and quite economical. This was a research carried out entirely by empirical methods guided by our knowledge of the methods used in dyeing cotton. As we are not immediately interested in the further development of dyeing wood, there is no reason for us to find out why the methods of dyeing cotton cannot be directly applied to wood. Perhaps some day the furniture manufacturers of this country will find it to their interest to investigate this problem. We have already published two communications from the laboratory to scientific journals. They are :—" Contrast and Exposure in X-Ray Photographs through Metals," by Dr. R. E. Slade, D.Sc., F.I.C. " The Fundamental Law for the True Photographic Rendering of Contrast," by A. W. Porter, D.Sc., F.R.S., University College, and R. E. Slade, D.Sc., British Photographic Research Association (*Philosophical Magazine*).

Results of research, whether theoretical or experimental, which are of general interest and not of immediate use for application to specific problems of the industry, are published at the first opportunity, to increase knowledge in photographic science generally, and to induce other workers to devote their attention to theoretical problems. As an example of the advantage to be gained by publication the first paper mentioned above caused a good deal of discussion in certain scientific circles, and as a direct result I combined with Professor A. W. Porter, F.R.S., in the production of the second paper, which clears up an important point in the fundamental theory of the photographic process, a point which Hurter and Driffield attempted but failed to elucidate.

The offices of the Association are at Sicilian House, Southampton Row, London, W.C. 1, and the Secretary is Mr. Arthur C. Brookes.

The Distillers Company

Alcohol Production for Munition Purposes

At the annual general meeting the chairman (Mr. Graham Menzies) in reviewing the position of the company, said that, taking the pre-war cost of labour per gallon of spirits produced, and comparing this with the year just closed, the increase was 113 per cent., equal to an increased distribution to labour of 113 per cent., and an increased distribution to capital (after deducting income-tax) of 12 per cent.

In dealing with the war work of the company, the managing director (Mr. W. H. Ross) said : During the war, which is now happily ended, our company has played an important part in supplying alcohol for munition purposes. On behalf of the Patent Still Distillers of the United Kingdom I approached the Ministry of Munitions Department towards the end of 1915 and offered to place our experience and resources at their disposal. This proposal was gladly accepted, and an arrangement was at once arrived at with practically the whole of the patent still distillers of the United Kingdom to pool their production. Not only so, but we arranged to give the Ministry the benefit of our distributing agency, the International Spirit Supply Company, through whom all spirits required by the Government were invoiced and settlements effected. By this means a considerable outlay was saved which otherwise the Government would have incurred in having to set up a special department with the relative machinery for dealing with the huge supplies of alcohol required for war purposes. That no charge of profiteering might be made against us we agreed that the profit charged on all alcohol supplied should be on a strictly pre-war basis, and we invited the Government accountants to inspect our accounts and agree with us at the end of each three months what the price should be for the ensuing quarter. At first it was only necessary to provide about 25 per cent. of the production for Government requirements, but early in 1916 Mr. Lloyd George, along with Mr. Runciman, then President of the Board of Trade, invited some of the distillers to meet them, when it was explained that in consequence of the uncertainty of obtaining the requisite supplies of acetone from America it was proposed to produce the article in this country, for which the distilling plant was readily adaptable. Again we proffered our active assistance, with the result that six of the largest distilleries in the country were handed over by the proprietors for this purpose without a penny of compensation being paid, while the remaining patent still distilleries were laid under voluntary tribute for an ever-increasing proportion of their make for Government purposes.

Government requirements of Alcohol

Towards the end of 1916 the Government's requirements of alcohol became so large that a special " Advisory Committee on Alcohol Supplies " was appointed to advise as to the best means for providing any increased supplies which they might require. The Patent Still Distillers once more came forward with a proposal to place their whole production of spirits at the disposal of the Government from Jan. 1, 1917, which was readily accepted. Not only did they place their then full production at the Government's disposal, but they, in many cases, extended their plant to meet any possible demands made upon them, and so relieve the mind of the Ministers concerned, that no shortage would take place. After the entry of America into the war, the Government decided to suspend the conversion of the distilleries into acetone works, only two of which having by that time reached the stage of producing. Since that date—Feb., 1917—these distilleries have remained closed, as although the licence to resume work was allowed in Jan., 1919, they have so far been unable to do so through a shortage of raw materials.

During the year 1917 the whole of the molasses distilleries—whose product goes for industrial purposes—were compulsorily closed down by the Government in order to preserve the available molasses for cattle food. These distilleries have not, so far, been able to restart, as, although molasses is again available the market for the resultant spirit has not yet recovered its normal condition, while the position is further complicated by the fact that the distillers have undertaken to find a market amongst their regular methylating customers for about 3½ million gallons of industrial spirits which the Government had on hand at the conclusion of hostilities.

From the end of 1917 until the end of 1918 the only distilleries in this country which were permitted to work were those which

combined yeast manufacture with the production of spirits. As has already been indicated, the whole of the spirit production was absorbed by the Government for munition purposes or by methylators, chemists, and others for essentially industrial uses. None of this spirit was allowed to be sold for potable purposes, with the exception of a small proportion which since the Armistice has been released under conditions laid down by the Government. As regards yeast production, which forms a necessary ferment for bread-making, this trade at one time was almost entirely in the hands of foreign distillers. About thirty years ago, however, the British distillers took up the manufacture, with the result that at the outbreak of war the home producer held about two-thirds of the whole trade in this country. The effect of the war was to cut off supplies immediately from Germany, France and Belgium, while the supplies from Holland and Denmark were considerably curtailed. This deficiency the British distiller had to make good, and, not only so, but he had to provide large quantities for the use of the British expeditionary forces in France as well.

What has been our reward? No sooner were our services deemed no longer indispensable to the Government than a new Committee was set up to deal with the question of the removal of certain restrictions on importation. In spite of the fact that the distilling trade in this country had been straining every nerve to assist the Government for three years or more, during which its own immediate business had perforce to be abandoned, and, in spite of protests from the Ministry of Munitions and the Ministry of Food, who alone were acquainted with the sacrifices which distillers had made, this Committee, with the authority of the President of the Board of Trade, has thrown open the gates of competition to Canada, South Africa, and other of our Colonies, by which to send in spirits here to harass the home producer, who has not had time nor can hope to recover his normal position for years to come.

Welsbach Light Company

Home Trade and Foreign Competition

At the annual general meeting of the Welsbach Light Co. (Ltd.), on Wednesday, Mr. J. R. Yates (the chairman) in moving the adoption of the report and accounts, said that the directors were able to report a net profit of £57,130 on the capital of £175,000—a result which, with the one exception of last year, was the best in the history of the company, and this in face of rising costs with the dislocation and unsettlement caused by the transfer from war conditions to peace. He reminded the shareholders that, like many other commercial concerns, they were dependent before the war for their raw materials on enemy sources of supply. By securing fresh sources of supply and making heavy forward contracts throughout the war they succeeded in obtaining the essential raw materials for their industry, but the company felt during the past year the full effect of the increased costs of these commodities, and increased wages were responsible for a further advance in cost of production over that of 1917-18. From the year 1912 their factory output of mantles had gradually risen by 100 per cent., and last year it was larger than in any previous year.

Under the vast system of dumping practised by the Germans before the war this country was swamped with quantities of goods delivered here at prices far under English factory cost and about half the German home price. Now that the Welsbach company and other manufacturers had, after almost insuperable difficulties, succeeded in establishing the British incandescent mantle trade on a basis independent of enemy supplies of raw materials, and had kept the home market going throughout the war, the question arose whether British manufacturers were to have a fair opportunity of supplying British requirements or whether they were to be crushed by under-cost price foreign goods.

A Bill had been introduced into Parliament dealing with the supply of electricity on a large scale—a Bill involving vast powers under centralised control backed by the State. The gas industry and its allied trades were watching—and the directors asked the shareholders, and, through them, their several members of Parliament, to watch—carefully the progress of this measure. To the strength of the gas position in lighting nothing had contributed more than the original invention of the Welsbach mantle—a world-wide benefaction, which, as a very eminent scientist recently remarked, had not been sufficiently recognised, and the importance of which, indeed, increased rather than diminished. Never was there a greater need for the conservation of coal supplies, and, as stated in the Report of Lord Balfour of Burleigh's Committee on Essential Industries, the gas mantle was one of the greatest factors in the economical use of coal. The scrubbing of gas for various residuals now so largely used for other important manufactures greatly diminished the illuminating power of gas and rendered the use of the gas mantle indispensable. The directors had decided to recommend the payment of a dividend of 10 per cent., and a bonus of 5 per cent. (less tax), which followed upon contributions in previous years of 2½ per cent., 5 per cent., and 10 per cent.

The report and accounts were adopted.

Baku Russian Petroleum Co

Amalgamation Proposals Adopted

At a general meeting last week a resolution was unanimously passed providing for the amalgamation of the respective undertakings of this company, the Russian Petroleum Company (Limited), the Bibi Eibat Oil Company (Limited), and the European Oilfields Corporation (Limited), by the sale thereof to a new company called Baku Consolidated Oilfields (Limited).

Mr. Herbert Allen (chairman of the company), in moving the formal resolution, said that the position of the Baku oil industry had undergone very little change since the various companies held their annual meetings towards the end of last year. During the late war the industry suffered severely, the production of the whole field having fallen from 7½ million tons in 1913 to 3½ million tons in 1918, but there were good reasons for hoping that the lost ground might eventually be not only recovered, but more than recovered. The rehabilitation of the industry would involve a large expenditure of capital on well repairs, new boring, and the provision of new plant and machinery; but, with one exception, the English companies were now practically without funds—not that they differed in that respect from the local firms. Nor was there any likelihood that, singly, they would have been able to overcome their financial disabilities and thereby participate in the recovery which might be expected under more settled conditions. Under the so-called Peace Treaty, just concluded in Paris under American auspices, the new Republic of Azerbaijan—which embraces Baku—was apparently to be recognised by the Great Powers, and the importance of the oil industry as a national asset should eventually ensure its proper treatment at the hands of the new authorities. The magnitude and importance of the four companies at Baku were shown by the fact that their united production of petroleum for the four indifferent years 1913 to 1916 inclusive amounted approximately to 77,000,000 poods (say 1,250,000 tons), an average of over 300,000 tons per annum, while their trading profit for the same period was £860,000, an average of £215,000 per annum. It was obvious, therefore, that an effort should be made to preserve such properties to their English owners. From the time he (the chairman) first became associated with this group of companies he had always had in mind their ultimate amalgamation.

Sir Watson Rutherford, M.P., in seconding the resolution, said that a great deal had been heard lately about coal and the price of coal, its shortage, not only here, but all over Europe, and the grave crisis which the trade and manufacturers of this country were now passing through owing to the demands of the miners and the alarming increase of price. They regretted this, as patriotic citizens, but as representing British interests at Baku—the oldest and still one of the most important oilfields of the world—it was some satisfaction to remember that the alternative to coal was petroleum, and that it would be the privilege of the new company to contribute a substantial quota of the fuel, which was essential to British interests, and at a price which he believed could not fail to be highly remunerative. Shareholders might possibly have noticed a short paragraph in the circular stating that the new company was formed on the footing of offering a participation to the British Government, together with the first call on the whole of the output of oil at market prices. The British Empire used over 30 per cent. of the petroleum output of the world, whereas strictly within its own boundaries it did not produce more than 3 per cent of the output. It followed that every British enterprise capable of producing petroleum should be, and was, a valuable asset for the United Kingdom and for the Empire at large.

Gas Power for Motor Traction

In Substitution for Petrol and Petroleum

THE report [Cmd. 263] of the Interdepartmental Committee on the use of gas as a source of power, especially in motor vehicles, supplements the interim report of April, 1918, and deals in particular with gas under pressure and that obtained from portable producer gas plant, besides giving some results of extended experience with flexible gas-bags. It is signed by all the members except the chairman, Sir Boverton Redwood, who, however, before his death, had approved the final draft.

The report states that gas traction is fully as safe as any other system of mechanical traction, even when exposed and unprotected flexible containers are employed, and in its newer form merits adoption as a commercial alternative to electric, petrol, or steam traction, more especially for the propulsion of motor omnibuses and other commercial types of road motor vehicles, including tramway-cars.

Flexible containers will, however, be generally superseded by semi-rigid and rigid containers, wherever compression plant can be installed, but in view of the uncertainties of the future of liquid fuel supplies, in relation to prospective world-wide demands, it is inexpedient to abandon or dismantle any existing facilities for gas-traction service. It is pointed out that users whose consumption is not less than 80,000 gallons of petrol a year have the commercial alternative open to them of making gas for themselves, in the event of an attempt being made to establish a monopoly of petrol at inflated prices.

Semi-rigid containers when made of rubber and canvas are declared to be unsatisfactory; but when consisting of an inner rubber bag suitably restrained by an outer member of woven steel wire with metal end plates, and complying with the Committee's approved specification, they appear to be satisfactory for internal pressures not exceeding 45 atmospheres, although the results of endurance tests in service are not yet available.

The time, it is stated, has now come to approve and encourage the use of metal cylinders made of carbon with certain alloy steels, which can now be safely employed for working pressures up to 2,250 lb. per square inch. Wire-wound metal cylinders, with removable ends held in place by screwed tension rods, are stated to lose gas at the joints after the earlier stages of discharge, and to be heavier for any given volume of gas than plain cylinders of high-carbon or alloy steel.

Subject to the adoption of the simple precautions specified, there is no risk of explosion with town gas during its compression into the cylinders or its use from them. The cost of compression, including maintenance of compressor plant, storage cylinders, and vehicle cylinders, with interest and depreciation, will vary between 1s. 8d. and 3s. per 1,000 cubic feet of free gas, according to quantity and working pressure adopted, but the total cost may be taken as being equivalent on the average to 7d. per gallon on any petrol replaced.

Gas-Making Plant on Motors

Reference is made in the report to three systems of making gas from plant carried on the vehicle itself, and in the case of one of these drawings are given of the arrangements. Such plants, it is stated, can be made to work automatically, after the necessary attention at lighting-up. Their fuel cost, with coke at 45s. a ton or anthracite at 55s. a ton, is equivalent to petrol at 5.4d. per gallon. One cwt. of coke or anthracite will, on the average, do the same work on the road as 5.6 gallons of petrol, and the weight of generator and accessories for a 30-b.h.p. engine is about 220 lb.

The risk of escape of unburnt carbon monoxide gas from a suction gas producer on a motor vehicle is not such as to call for special precautions, except when the vehicle is at rest within a closed structure with the fire still burning in the producer. The water feed to a portable suction gas producer can be so adjusted as to increase the calorific value of the issuing gases by as much as 50 per cent. on a consumption of water falling as low as 25 per cent. by weight of the simultaneous combustion of coke or anthracite. In an ordinary motor vehicle engine, unaltered structurally as regards the compression space, the power yield, on the basis of 100 for petrol, may, on the average, be taken as 91 for town gas of 450 B.Th.U. gross per cubic feet, 87 for suction-producer gas (partly hydrogenated with water gas), of 210 B.Th.U., and 82 for suction-producer gas of 140 B.Th.U.

Ammonia Production by Haber Process

IN an article in the *Observer* on the work of our scientists during the war, as illustrated at the Scientific Products Exhibition, Sir William Tilden, F.R.S., reminds us that chemistry plays a part in many directions beside that of producing definite compounds such as dyes, drugs and perfumes. A conspicuous example, he says, is to be found in the direction of metallurgy. Before the war the production of tungsten, an indispensable constituent of high-speed tool steel, was entirely a German industry. For other purposes steels containing chromium, molybdenum, vanadium, and manganese are available only as the result of previous research by the chemist. The same is true of some of the new alloys, such as duralumin, used in the construction of aircraft. But the application of chemical principles is indispensable in many directions in agriculture, in physiology, and medicine, in water supply and sewage disposal, in the preparation and manipulation of fuels, whether solid, liquid, or gaseous, in the production of paper and textiles. The chemist is to be found, or ought to be found, everywhere.

One of the methods characteristic of modern industrial chemistry is the production synthetically—that is, by union of elements—of compounds previously obtainable only from natural sources. It is only necessary to mention the production of indigo and madder dyes from coal tar by way of illustration, and specimens are to be seen in the exhibition. There is, however, one serious omission for which some explanation is wanted from official sources. For some years past the Germans have been making large quantities of ammonia by Haber's process, which consists in combining hydrogen with nitrogen from air by treating the compressed gases in contact with a "catalyst." The resulting ammonia may be converted into sulphate and used on the land, but during the war the Germans have been largely dependent for the nitrates requisite in all explosives upon a second process by which the ammonia was made to combine with oxygen under the catalytic influence of metallic platinum and so converted into nitric acid. Some two years ago an investigation was started at University College, Gower Street, by the Munitions Inventions Department, for the purpose of studying the conditions under which the ammonia process is workable, and it was understood to be so satisfactory that the Government had acquired land on which they were about to erect a large factory for the production of ammonia by the Haber process. Then suddenly, about twelve months ago, the scheme was abandoned, and no one seems to understand how this retreat is to be explained. It certainly is not because English chemists and engineers are incapable of carrying out anything found practicable in Germany. Undoubtedly some further research may be necessary, but that is not a sufficient excuse for assuming a position which is discreditable to the country.

Turning to the future, he adds:—"There will be serious competition, not alone from the Germans, from whom for the present we shall be partly protected, but America will have to be reckoned with as well as others of our Allies. We are also but ill supplied with scientific technologists, upon whom so much will depend in the future. On this account the public and men of business will do well to remember the debt we owe to the universities and colleges of the United Kingdom, and that if we hope to hold our own in the strenuous years which lie before us, the rising generation must be educated on the right lines, and prospects held out good enough to secure for the service of the country a due proportion of existent natural ability equipped with a full armoury of scientific technical knowledge."

A fire broke out on Saturday on the premises of Messrs. Dennis & Roberts, chemists and oil merchants, Clumber Street, Nottingham. Considerable damage was done, but the fire brigade succeeded in saving the bulk of the inflammable materials in stock.

A *Times* correspondent states that there is very likelihood that further operations will be carried out at an early date in connection with the development of the oil resources of British Guiana. Early in the year three geologists arrived in the colony and carried out surveys over an area of 2,000 square miles in the north-western section, in the interest of the Venezuela Oil Concessions, Ltd. It was stated at the time that the geologists were none too enthusiastic over the prospect of oil being found there. It is known, however, that three shipments of oil-boring machinery have been landed at Georgetown for further operations, and engineers are expected to follow soon.

From Week to Week

A bacteriologist is required for service under the Isle of Man Government.

The death took place on Saturday, at Morecambe, in his sixty-first year, of Mr. Breaks, who for many years represented Messrs. Levinstein, Ltd.

The late Mr. H. Greenwood, of Regent House, Accrington, manager for Messrs. W. Blythe & Co., chemical manufacturers, Church, has left estate to the value of £7,941, with net personalty £7,963.

On Monday the Supreme Council in Paris discussed the question of the resumption of postal relations with Germany. It was agreed to resume the parcel post service from Great Britain to Germany.

The interview with Sir Robert Hadfield, Bart., F.R.S., which was published in THE CHEMICAL AGE of June 28, has been reprinted, and makes an interesting pamphlet of sixteen pages on "The Chemist's Place and Function in Industry."

Mr. G. W. Hoare, a Cork veterinary surgeon, giving evidence before the Select Committee of the House of Lords on the Animals (Anæsthetics) Bill, condemned the practice of dishorning cattle, and stated that the application of caustic potash to the horns before the cattle were six months old would prevent the horns from growing and would be painless.

Dr. E. K. Rideal, one of the contributors to THE CHEMICAL AGE, leaves England on August 20, for Illinois, U.S.A., where he has accepted an appointment for twelve months as Professor of Physical Chemistry. Dr. Rideal's purpose in taking up the appointment is to enlarge his experience, and we hope to have some contributions from him during his stay in America.

Sir Robert Hadfield is offering £200 in prizes for essays on one of three subjects: (1) A practical scheme for the joint development of industry by capital and labour; (2) the most effective means for the prevention of unemployment; (3) the most effective means for the prevention of industrial disputes. The prizes offered are of £100, £50, and £10, with eight of £5 each.

Progress in the stabilising of industry by the work of the Joint Standing Industrial Councils under the Ministry of Labour is recorded in the Ministry's monthly bulletin. From January, 1918, to the end of last June, councils had been set up in forty-one different industries, comprising 2,438,500 employees. The improvement of production forms a feature of several of their reports.

Mr. George Barker, for twenty-five years manager of the Runcorn Alkali Works of the United Alkali Co., was found dead in bed on Saturday morning, after having retired apparently in his normal health. He was fifty-five years of age, and first gained his knowledge of the chemical trade under his father at the Liver Works, Widnes, which were eventually absorbed by the United Alkali Co. The chemical trade was well represented at the funeral at Widnes, on Tuesday.

The Council of Armstrong-College, Newcastle, have appointed Lieutenant-Colonel Sir Theodore Morison, K.C.I.E., K.C.S.I., Principal of the College, Sir Theodore Morison was educated at Westminster and Trinity College, Cambridge, and went to India in 1889, returning in 1905. He held a commission in the Cambridge Regiment (Territorials), and served in France and German East Africa. Captain J. F. T. Grieg (London) was appointed Registrar of the college.

In the July examinations for the Associateship of the Institute of Chemistry (A.I.C.), one candidate passed in branch (*a*) Mineral Chemistry: Lieutenant C. W. Wood, King's College, London; two candidates passed in Branch (*d*) Organic Chemistry; L. G. Peirson, B.A. (Cantab.), and J. E. Pollock, B.Sc. (London), University College, Reading; and one candidate in branch (*g*) Chemical Technology, with Textile Chemistry as special subject: P. E. Stanhope, Royal Techninal Institute, Salford.

Liquid oil has been found on the Norfolk shale properties of English Oilfields, Ltd. In borehole No. 17, towards the eastern edge of the properties acquired, the test bore through the shalee beds encountered liquid oil which, coming up to the surface of the hole, flowed into the river which runs near by. Dr. Forbes Leslie is of opinion that oil deposits underlie the rich shales which are found in the neighbourhood. The discovery of the ozokerite, which was reported last week in bore-hole No. 16 at Stow Bridge, is now confirmed, though it is impossible so far to state the total thickness of the seam.

The National Benzol Association announces that, with the co-operation of the Motor Fuels Joint Committee, an Advisory Committee has been formed with the following terms of reference: To advise in respect of any general matters the National Benzol Company, Ltd., may refer for assistance and suggestion; To make suggestions to the company in respect of any proposals to popularise the use of benzol by motorists and increase the consumption; To watch the development of other home produced motor spirits and to advise the board as to co-operation in any or all of these developments.

Captain Frederick Harvey, R.N., who died last week in his 89th year, was known as the joint inventor, with his brother Captain John Harvey, of the first torpedo apparatus supplied to ships of the British Navy for use when in motion. The Harvey torpedo, as it was known, had to be towed, and to manœuvre with it from a ship a speed of about six knots was required. In shape it was similar to an otter used for fishing purposes, and when towed at a distance of 150 yards or so always diverged from the ship's quarter at an angle of about 45 deg. The explosive, rifle fine-grained powder or gun-cotton, was fired by a metal bolt on the torpedo coming into contact with the bottom of a ship. Although a formidable weapon, provided the attacking vessel could be manœuvred to bring the machine into contact with the opposed ship, the Harvey torpedo was never tried on active active, and was soon superseded by the self-propelling torpedo, such as is known to-day.

Dissatisfaction in the centres where the soap, candle, and oil refining industries are carried on, was discussed at a gathering of workers in the Port Sunlight and Bromborough district on Sunday. Recently, a demand was made before the Court of Arbitration for 15s. per week advance for men, and 7s 6d. per week for youths and women, and it was refused. Reports from Leeds, Manchester, Birmingham, London, Glasgow, Bristol, and other places were submitted as to the feeling of the workers, and the Port Sunlight shop stewards committee during the week had passed a resolution requesting the union Executive to take action within ten days. Mr. Jones, one of the organisers, said the question had not been overlooked by the Executive Committee, and they had decided it was no use fighting this question locally. They were going to make it a national question. A resolution to defer further action until after the Industrial Council meeting was unanimously passed.

Lord Moulton, who is an "Old Boy" of Kingswood School, Bath, distributed the prizes there on Monday. Reference was made to the difficulties which Lord Moulton had to overcome as Director-General of the Supply of Explosives during the war. Mr. H. A. Wootton, the new Headmaster of Kingswood School, held an important appointment in connection with the making of explosives during the war; and tribute was also paid to the valued services of another "Old Boy" of Kingswood—Dr. Martin Lowry, Technical Director of Shell Filling. The difficulty of obtaining sufficient of T.N.T. made it necessary to use for shell filling a mixture which had at first proved suitable only for bombs and grenades. But for the work of Dr. Lowry, the use of this mixture as a high explosive for shell filling would have been impossible. Dr. Lowry was afterwards sent to America and to Italy to advise the Governments of those countries regarding shell filling; and his methods were being adopted, or on the point of adoption, by the Americans, the Italians, and the French when hostilities ceased.

At the invitation of Sir Robert Hadfield some 200 representatives of the firm of Messrs. Hadfield's, Ltd., Sheffield, including directors, members of the technical, financial, and commercial staffs, the research department, managers, foremen, workmen, and boys, visited London on Wednesday to inspect the British Scientific Products Exhibition, Central Hall, Westminster, and the Science Exhibition, South Kensington. At a luncheon at the Central Hall, Sir Robert Hadfield presided. Sir Richard Gregory, chairman of the Committee of the British Scientific Products Exhibition, said that the lesson to be learned from the exhibition was that modern civilisation demanded progressive work from science and from industry. After lunch a visit was paid to the Science Museum at South Kensington, where the party was joined by Prince Albert, who spent half an hour with them in looking over the exhibits. The Prince, who is chairman of the Industrial Welfare Society, expressed his pleasure at meeting such a happy lot of workers, and said he would be very glad to receive a copy of the essay which won the prize offered by Sir Robert Hadfield to the boy who wrote the best account of his visit to London.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

BOILERS. Exact data on running of steam boiler plants. D. Brownlie. *Engineering*, July 25, 101-104. Gives exact working details of 100 typical colliery steam boiler plants. The average net working efficiency was found to be 55.5 per cent.

COPPER. Advance statistics of United States copper production in 1918. *Board of Trade J.*, July 24, 129-130. The total production of primary copper was 1,908½ million lb. (1,886 million lb. in 1917), and in addition over 43½ million lb. of secondary copper (from scrap, &c.) was produced. The output of new refined copper in 1918 was 2,432 million lb., an increase of 4,000,000 lb. over 1917.

FACTORIES. Scientific lighting and industrial efficiency. L. Gaster. Abstract of lecture delivered at British Scientific Products Exhibition. *Gas J.*, July 29, 248. Points out close relationship between good lighting and health of the workers, and quotes instances of output being increased by 8.27 per cent. as a result of improved lighting.

GAS. Exhaust steam in water-gas generators. Abstract of paper by R. L. Greene in New York *Gas Age*. *Gas J.*, July 29, 240. A reduction of 21 per cent. of boiler fuel used is recorded chiefly due to use of exhaust steam instead of live steam for generators.

LIMESTONE. Limestone products. W. A. Brown. *Proc. S. Wales Institute of Engineers*, Vol. 35, No. 1, 119-159. Brief general description of limestone products, including lime, hydrated lime, and Portland cement, and plea for greater development of the British industry.

PLANT. Further improvements on the Draper washer. J. M. Draper. *Proc. S. Wales Inst. Eng.*, Vol. 35, No. 1, 21-39. Description of the latest form of Draper hydraulic classifier for washing coals, clays, &c.

POWER. Fuel economy in power production, or utilisation of waste heat. W. T. Lane. *Proc. S. Wales Inst. Eng.*, Vol. 35, No. 1, 171-210. Prize essay, dealing *inter alia* with utilisation of waste heat in connection with carbonisation of coal and generation of steam.

STEEL. Canada's national steel plant. W. F. Sutherland. *Engineering*, July 25, 106-107. Description of Toronto plant for manufacture of steel from turnings and other scrap from shell factories. Installation comprises ten electric melting furnaces of Héroult 6-ton type and a forge plant.

TRADE. Chemical trade (imports and exports) of Hong Kong. *Chem. Trade J.*, July 26, 94.

American

ANALYSIS. X-ray chemical analysis. A. W. Hull. *J. Franklin Inst.*, July, 131-133. Brief description of new method of analysis, which can be applied to very small quantities of mixtures of salts and other substances, and is capable of giving results accurate to within 1 per cent., when only 1 per cent. of the particular component is present in the mixture.

FACTORIES. Industrial lighting. C. E. Clewell. *J. Franklin Inst.*, July, 51-90. Discusses the natural and artificial lighting of factories, the various factors involved, and the beneficial results of improved lighting.

FURNACES. Blast-furnace explosions. B. B. Hood. *Eng. and Min. J.*, July 12, 47-49. Gives precautions necessary to guard against explosions on shutting down blast-furnaces.

GRAPHITE. Refining flake graphite for manufacture of crucibles. F. G. Moses. *Eng. and Min. J.*, July 12, 50-54. As a result of experiments described, it has become possible to obtain Alabama graphite in a condition suitable for crucible making.

German

CORROSION. Corrosion by stray currents from electric railways, &c. Report of a Joint Committee of the Schweiz. Gas-und Wasserfachmännerverein, the Verband Schweiz. Sekundärbahnen, and the Schweiz. Elektrotechn. Verein. *J. Gasbeleucht*, July 5

GAS. Comparative tests with a Glover-West retort and a Dessau vertical retort of the 1912 type. *J. Gasbeleucht*, June 28, July 5.

NITRIC ACID. Review of progress in nitric acid industry in 1917 and 1918. K. Reusch. *Chem. Zeit.*, July 8, 414-416.

PLANT. Thermo-electric measurement of temperature of surfaces. Combined abstract of papers by Fudickar-Heaky (*Gesundh.-Ing.*, 1919, 125) and Van Rinsum (*Z. Ver. Deuts. Ing*, 1918, 604). *J. Gasbeleucht*, July 5, 372-374.

New French Customs Duties

By a French Presidential Decree of the 8th July the Customs duties leviable on a large number of manufactured goods on importation into France and Algeria were increased. For this purpose, for each category of goods specified in the tariff, a "co-efficient" or multiplier was fixed representing the relation between the values of the goods in 1913 and in 1918 according to the official values laid down for those years by the Permanent Commission on Customs Values. The present rates of duty are, therefore, the specific rates contained in the pre-war tariff multiplied by the "co-efficient" (varying from 1.1 to 3) attributed to the class of article concerned.

A Parliamentary Return entitled "France and Algeria: Increase of Customs Duties," which has been published by the Board of Trade, contains a translation of the Decree and of the Ministerial report explaining its nature and object, together with a statement showing in detail the French tariff rates of duty on the articles affected by the increased duties and the "co-efficient" or multiplier established in each case.

Copies of the Return may be purchased at a cost of 9d. per copy (exclusive of postage), either directly or through any bookseller from the sale depots of His Majesty's Stationery Office. In ordering copies, the reference number "Cmd. 273" should be quoted.

Among the increases are the following in metals and chemical products:—

Tariff number ex 205 bis. Iron and steel. Ferro-manganese containing more than 25 per cent. and less than 90 per cent. of manganese; ferro-silicon containing more than 5 per cent. and less than 20 per cent. of silicon; silico-spiegel rich, containing at least 20 per cent. of silicon and manganese, co-efficient 3. Ferro-silicon containing 20 per cent. or more but less than 90 per cent. of silicon, 1.9.

207 ter. Fine steel for tools, 2.7.

207 quat and 207 quinq. Special steels, 1.9.

211. Iron, tinned (tinplate) or coated with copper, lead, or zinc, 2.

Ex 221. Copper, pure or alloyed, rolled or hammered in bars, 2.4. Rolled or hammered in plates, 2.3. In wire, 2.5.

Ex 222. Lead rolled, 2.6.

Ex 224. Zinc rolled, 3.

Tariff number ex 280. Chemical products obtained from coal tar, 2.5.

294. Dyes derived from coal tar, picric acid, and other colouring matters, 3.

A Government cable is now in operation between this country and Canada. All telegrams for Australia and New Zealand handed in at post offices are forwarded by this cable to Canada for transmission by the State-owned Pacific cable, unless they are specially marked by the senders to be sent by another route. Telegrams for Canada and the West Indies which are handed in at post offices marked with the words "*via* Imperial" are also sent by the cable. The charges are the same as those of the other Atlantic cables

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. Lists of patent applications and of "convention" specifications open to inspection before acceptance are added; abstracts of the latter appear as soon as possible thereafter.

Abstracts of Complete Specifications

118,605. Aluminous Materials, Process of Purifying. Norton Co., Assignees of L. E. Saunders, Niagara Falls, N.Y., U.S.A. International Convention date (U.S.A.), August 18, 1917.

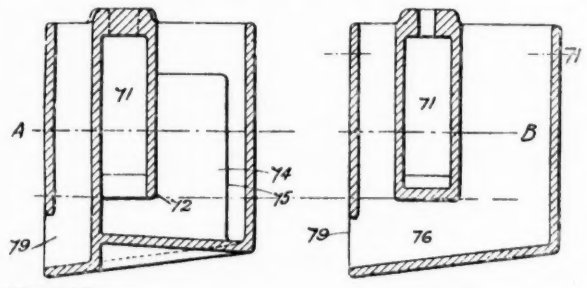
Aluminous material, such as clay or bauxite, is fused with an excess of carbon over that required for the reduction of the contained oxides of iron, silicon, and titanium, so that a substantial reduction of the alumina is also effected. The reduced impurities are separated, and the reduced alumina is then re-oxidised by fusing in an electric furnace with solid oxidising substances, such as iron oxide, or any of the normal oxides contained in bauxite, or bauxite itself. Volatile substances, such as sodium carbonate, zinc oxide, &c., may also be used.

121,124. Carbon Matter, Apparatus for Completely Gasifying Combustible. L. Colson, 58, Rue de Maubeuge, Paris. International Convention date (France), November 26, 1917.

A mixture of coal and lime is charged into a vertical retort, which is heated externally by heavy oil or gas burners. Steam is then injected, and a mixture of carbon dioxide, hydrogen, and methane is given off. The gas is passed through a coil immersed in a solution of potassium bicarbonate, which is thereby converted into carbonate by the heat, and then through a hydraulic seal to prevent back flow of gas. The gas then passes through a force pump to a cooler, and thence to an absorption apparatus, where any ammonia is extracted, either as ammonia solution or as sulphate. The gas is then passed through a solution of neutral potassium carbonate, obtained by the heating of the bicarbonate as above, to absorb the carbon dioxide and reproduce the bicarbonate, which is then returned to the first cooling tank. The purified gas is then collected in a gas-holder.

126,640. Electrolytic Gas Generators. I. H. Levin, 15, William Street, New York. International Convention date (U.S.A.), May 22, 1917. (*See Illustration.*)

Relates to the type of generator for producing oxygen and hydrogen from water containing an electrolyte, in which the

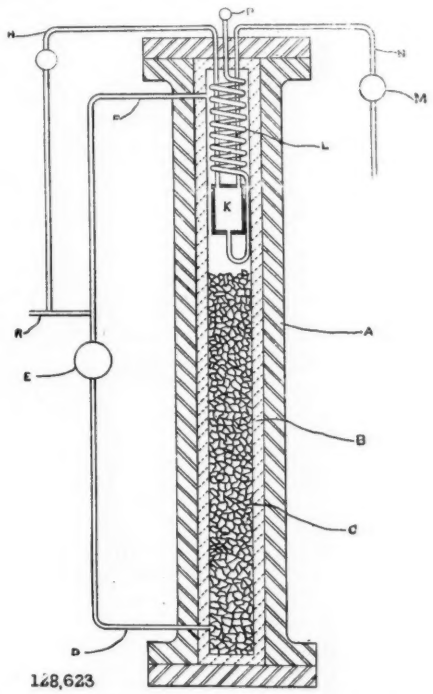


126,640

casing consists of two recessed members, insulated from one another and forming the electrodes. Liquid is supplied and gas delivered through the device shown in the illustrations, one of which is inserted into each compartment of the casing and dips into the liquid, the normal level of which is shown at A—B. The liquid flows downward through a passage 71, under the partition edge 72, then in front of partition 74 and round the edge 75 to the back, and thence to the passage 76, shown in the right-hand illustration, which is a section taken behind the partition 74. The liquid is discharged through the opening 79 into the casing. The device forms a liquid seal for the liquid supplied, and separates the gas and releases it when the pressure becomes excessive.

128,623. Pressure Furnaces Particularly for Use in the Synthesis of Ammonia. E. B. Maxted, 63, Highgate Road, Walsall, Staffs, and T. A. Smith, "Westmount," Highgate, Walsall, Staffs. Application date, August 14, 1917. (*See Illustration.*)

The furnace is suitable for conducting reactions at high temperature and pressure. A steel shell A is provided with a non-conducting lining B, and contains the catalyst C. The reaction gases are circulated by the pump E through the pipe F, catalyst C, and pipe D, fresh gas being introduced at R. Combustible gas and air are introduced into the chamber K by the pipes H and N respectively, while the air pump M maintains a pressure equal to



128,623

that in the furnace. The mixture burns completely in the chamber K, and a relief valve P is provided above the coil L. The gases from the pipe F are thus heated by the coil L and combustion chamber K. The combustible gas may be a nitrogen-hydrogen mixture by-passed from the pipe R.

128,640. Volatile Solvents Used in Manufacture, Process for the Recovery of. J. H. Brégeat, 6, Rue St. Georges, Paris. International Convention date (France), May 25, 1917.

A process for the continuous recovery of solvents, such as methyl or amyl alcohol, ethyl or amyl acetate, carbon tetrachloride, chloroform, dichlorethylene, trichlorethylene, tetrachlorethylene, tetrachlorethane, pentachlorethane, or petrolic ether. The gas containing the solvent vapour is treated with phenol or its homologues, such as the cresols, and the solvent dissolved. The solvent is recovered by heating or by steam distillation.

128,660. Destructive Distillation of Carbonaceous Materials to Increase the Aromatic By-products Thereof. F. M. Parkin, 59, New Oxford Street, London, W.C. 1, and Nitrogen Products and Carbide Co., Ltd., Winchester House, Old Broad Street, London, E.C. 2. Application date, August 28, 1917.

The charge of coal is heated in a vertical retort to a temperature

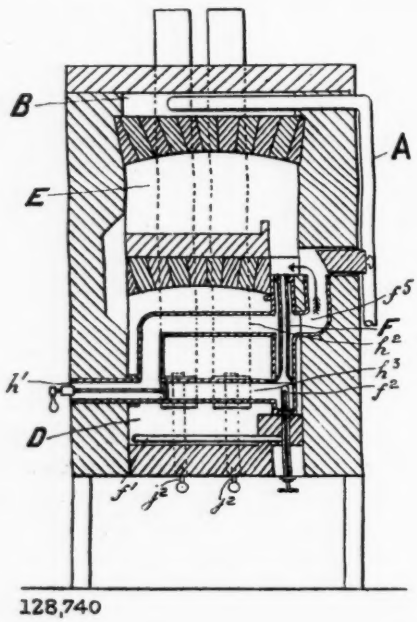
which increases from the top downwards. " Stripped " gas, such as that derived from the same retort is mixed with acetylene and passed upwards through the charge, and withdrawn with the distillation gases. It is found that with an admixture of 2.5 to 10 per cent. of acetylene the conversion of the acetylene into benzol is more complete than with pure acetylene. Producer gas or any other inert gas may be used in place of the " stripped " gas.

128,676. Zinc, Copper, or other Metals, Electrolytic Production of. Soc. de Métallurgie Electrolytique, 94, Rue Saint-Lazare, Paris. International Convention date (France), October 28, 1916.

The cathodes are formed of a number of discs threaded on to a horizonal shaft, separated by sleeves and clamped in position, and arranged to rotate with the lower parts of the discs immersed in the liquid. The anodes are formed of plates of lead or other acid-resisting conductor having an active surface less than that of the cathode, and alternating with the cathode discs, but fixed in position. The anode plates are inclined so that they are further from the edges of the cathode discs than from the central parts to render the deposit more uniform, and for the same reason the periphery of the cathode discs is covered with an insulator of a mixture of wax and resin. To obtain a compact deposit the cathode discs are wiped while they are outside the liquid by flexible rubbers pressed resiliently against the discs.

128,740. Oven or Furnace, Regenerative. B. W. Brocks, 24, De Beauvoir Square, London, N. 1. Application date, June 28, 1918. (*See Illustration.*)

A gas oven for use in re-heating metals or smelting ores is provided with means for producing a very high temperature in a reducing atmosphere. The gas supply enters through the pipe A, which passes through the heated chamber B and then down to the



128,740

pipe f^1 in the combustion chamber D. The gas then passes to the regulable nozzles f^2 of a number of burners. The air supply enters the passage h^1 and passes into the two branches h^2, h^3, the lower passage h^3 supplying the heated primary air to mix with the gas in the tube F. The passage h^2 supplies the heated secondary air to the burner nozzle through the passage f^3. Circulation of the secondary air through the passage h^2 is caused by a " pilot light " j^2. The heating space of the furnace is shown at E.

128,806. Hydrocarbons, Process and Apparatus for Cracking. A. E. White, London (from Sinclair Refining Co., 111, West Washington Street, Chicago). Application date, September 12, 1918.

To prevent the deposition of carbon when cracking oils at high temperature and pressure, and consequent overheating of the retort, the oil is rapidly circulated upwards through vertical pipes or tubes passing through the heating flues of the furnace. Each tube forms a straight passage through the furnace, and the tubes are connected to common mains above and below. Traps are provided in connection with the lower mains, in which the carbon is deposited instead of in the heated pipes. The oil is circulated by means of a screw propeller having a shaft passing through a stuffing box. To prevent escape of oil which is above its ignition temperature, cold oil is retained in a chamber surrounding the stuffing box, at a pressure higher than that of the hot oil.

128,815. Fuel, Artificial. D. Evans, Ynys Cottage, Brecon Road, Ystradgynlais, Brecon. Application date, November 19, 1918.

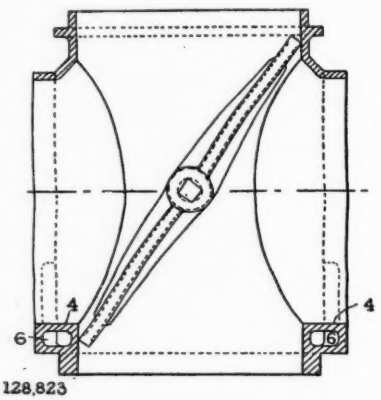
A mixture of 75 per cent. of anthracite duff, 14.5 per cent. of colliery shale or clay, 8.5 per cent. of pitch, and 2 per cent. of common soda liquid is made into briquettes.

128,818. Antimonious Oxide. E. F. Morris, Holly Bank, Roby, near Liverpool. Application date, October 8, 1918.

In producing antimonious oxide from the molten metal about 1 per cent. of sulphur is maintained in the molten metal during oxidation. This may be done by adding sulphur, sulphide of arsenic, or preferably high-grade crudum.

128,823. Gas-reversing Valves for Regenerative Furnaces. F. W. Knowles, Ivy House, Thornhill Lees, Dewsbury. Application date, October 24, 1918. (*See Illustration.*)

The valve port is provided with an air space 6 open at each end



128,823

to the atmosphere immediately under the sills 4. Burning of the seating by impact of the hot gas is thereby avoided.

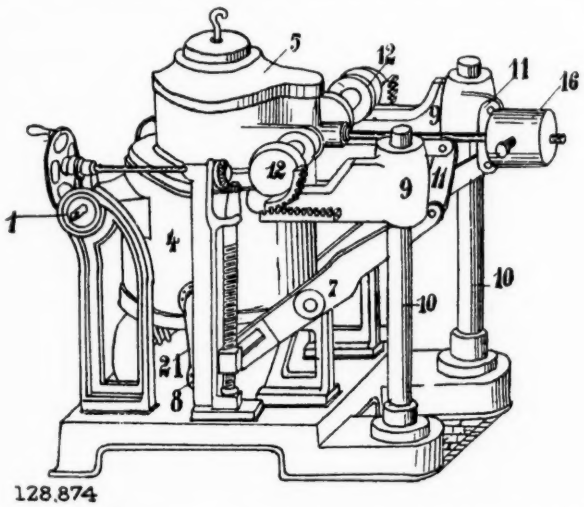
128,833. Tin from Tinned Metals, Recovery of. A. W. Gregory, 50, Crooms Hill, Greenwich. Application date, October 10, 1918.

Tinned scrap is treated with a hot solution of ammonium polysulphide, with or without the addition of caustic alkali. The tin dissolves, forming a soluble sulphostannate, from which the tin may be recovered by precipitation as sulphide. Alternatively the solvent may consist of any soluble polysulphide mixed with an ammonium salt to form ammonium polysulphide.

128,874. Crucible Furnaces, Rocking. M. Mathy, 28, Rue Leopold, Flemalle-Grande, Belgium. Application date, February 22, 1919. (*See Illustration.*)

The furnace 4 is pivoted on an axis 1 close to the lip of the crucible so that the lip is in an almost constant position. The cover 5 is arranged so as to balance the weight of the furnace during its rocking movement. The wheels 12 carrying the cover are adapted to roll on the brackets 9 so that when the cover is withdrawn it rests on the shoulders of the brackets 9 near the columns 10, and is turned into a vertical position with the aid of the balance weight 16. The brackets 9 are slidable on the

columns 10, and carry the links 11 attached to the levers 7, the further ends 8 of which are attached to the furnace by links 21.



128,874

The weight of the cover thus oscillates the lever 7 about its pivot, and tips the furnace and crucible into a horizontal position.

Latest International Convention Specifications Open to Inspection

126,965. PHENOLS, RECOVERING. M. E. L. Ponchon, 4, Rue des Ecoles, Ban-Saint-Martin, Lorraine. International Convention date, May 10, 1918.

Phenol and cresols are recovered from gases by washing them with mineral, vegetable, or animal oil, treating the solution with air, gas, or steam at 100°-150° C., and finally condensing the vaporised phenol.

126,972. FUEL, ARTIFICIAL. D. Markle, Hazleton, Pa., U.S.A. International Convention date, September 11, 1917.

Consists of anthracite culm, with about 15-35 per cent. of hard pitch, heated to about 700° C.

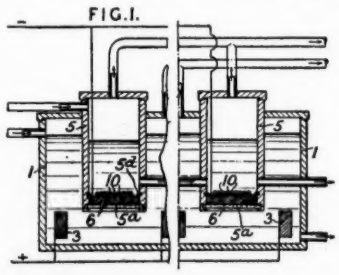
127,243. ALLOYS. Soc. Anon. Commentry-Fourchambault et Decazeville, 84, Rue de Lille, Paris. International Convention date May 22, 1918.

An iron alloy for use in apparatus working at low temperatures is composed of 40-70 per cent. of nickel and 0.8-5 per cent. of manganese, the remainder being iron. Other elements may be present, the higher limits of their proportions being: carbon, 1 per cent.; chromium, 5 per cent.; copper, 10 per cent.; vanadium, 0.2-1 per cent.; titanium, 0.1-0.5 per cent.

127,255. ELECTROLYSIS. B. Cataldi, Polonghera, Cuneo, Italy. International Convention date, May 20, 1918. (*See Illustration.*)

For electrolysing a chloride solution, separate mercury cathodes 6 are contained in vessels 5 depending into the tank 1, the mercury resting on a very porous diaphragm 5 , *e.g.*, of asbestos. To prevent flow of alkali into the main tank a ring 5a of iron is

FIG.1.



127,255

provided at the mercury surface, or the vessel may be provided with a sheet-iron lining. The anodes 3 are placed so that chlorine does not impinge on the diaphragms.

129,062. Heat treatment of chemical compounds. F. X. Govers. July 18, 1918.

129,071. Gas producers. A. L. Galusha. July 15, 1918.

129,074. Ammonium nitrate fertilisers. Norok Hydro-Elektrick Kvaelstofaktielskal. July 19, 1918.

129,092. Bitumens from shale, &c., Recovering. H. D. Ryan. March 25, 1918.

129,094. Ovens with regenerators. Soc. de Fours a Coke et d'Enterprises Industrielles. July 16, 1918.

129,096. Oil from shale and other carbonaceous materials, Recovering. G. W. Wallace. February 18, 1918.

129,097. Carbonaceous materials, Distilling. G. W. Wallace. March 26, 1918.

Specifications Accepted, with Date of Application

128,964. Expressing Liquid from Materials containing the same, Apparatus for. C. A. N. Wallich. April 20, 1917.

129,002. Alkali Fusion of Aromatic Sulphonic Acids. South Metropolitan Gas Co. and E. V. Evans. September 17, 1917.

129,024. Ether and Alcohol from Vapour-laden Air, Recovery of. R. A. Craig, Sir R. Robertson, J. I. O. Masson, and A. A. Drummond. September 26, 1917.

129,046. Ignitable Metallic Mixtures. C. Vautin, and Thermalloy, Ltd. January 17, 1918.

129,074. Trinitrotoluol and other Crystallisable Organic Compounds, Decolourisation and Purification of. H. N. Morris & Co., H. N. Morris, and J. Sable. June 5, 1918.

129,083. Electrolytic Cells. H. C. Jenkins and C.I. Syndicate. June 28, 1918.

129,091. Pitch, Apparatus for the Destructive Distillation and Carbonising of. F. M. Perkin and Nitrogen Products and Carbide Co. June 29, 1918.

118,095. Sulphuric Acid, Concentration of. F. Perrin. July 4, 1918.

129,135. Liquid Fuel Burners. E. C. Kahn. July 6, 1918.

129,139. Coal and the like, Retorts for Use in the Destructive Distillation of. J. West and W. Wild. July 17, 1918.

118,101. Pulverulent Fuel, Feeding Devices for. Motala Verkstads Nya Aktiebolag. December 31, 1914.

129,199. Pulverised Fuel, Apparatus for Feeding. Fuel Saving Co. September 27, 1918.

129,222. Mixing and Agitating Machines and Appliances. W. H. Read (from Read Machinery Co.). February 4, 1919.

126,274. Sulphide of Zinc, Process for the Preparation of Anhydrous. P. Comment. April 30, 1918.

Aluminium in Chemical Plant Construction

A booklet on this subject issued by the British Aluminium Company, Ltd., refers to some interesting technical applications of aluminium in the chemical industries. Among the apparatus for which it seems specially suited are mentioned brewing vessels, varnish pots, and condensing stills, the two chief problems being first cost and constructional difficulties (except in the smallest sizes of vessels). Aluminium, it is stated, is suitable for practically all purposes, provided it is not brought in contact with hydrochloric acid, halogen solutions and caustic alkalis. Thus, in brewing, it has no effect whatever on the reproductive power of yeast cells, facilitates earlier "racking," and is more easily cleaned and lasts better than wooden vessels on account of its non-porous nature. Similarly, aluminium vessels have been very widely used in the varnish industry, for sugar refining, for storing foodstuffs, and for jam making. It is remarked that fruit acids met with in the latter process are apt to attack copper, but have no effect on aluminium. For all practical purposes aluminium is also unaffected by fatty and vegetable oils and can accordingly be used with success in the preparation of stearic and palmitic acids, and especially the edible oils and fats which were notoriously difficult to handle until aluminium was available in sufficient quantity.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. Only commodities whose values are at the time of particular interest or of a fluctuating nature are included in our weekly report. A more complete list and report, including a Continental and American report, appears in the first issue of each month, and will include prices of plant supplies, building materials, structural steel, fuels, glues, ores, refractories, metals, minerals, and miscellaneous materials, as soon as the necessary arrangements are completed. The present report contains some of these items. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report. Suggestions and criticisms in regard to these pages will be welcomed.*

British Market Report

THURSDAY, July 31, 1919.

THE Home Trade demand for chemicals this week can only be described as moderate, but on Export account business continues to be very active, and some large orders have been placed in this country. The Far Eastern markets seem to be rapidly recovering, and some satisfactory reports are now reaching this country.

The American manufacturers are competing very keenly in some markets, and are quoting favourable terms of payment.

Prices generally are well maintained, and in some products further advances have to be noted.

The import restrictions are affecting prices of some products, more especially those for fine chemicals, for which import licences are not likely to be granted.

General Chemicals

ACID ACETIC.—This market is very firm, and higher prices have been paid for forward delivery.

ACID OXALIC.—Only strictly moderate business is being transacted in this material, in view of the lower quotations reaching this country from foreign makers.

ARSENIC.—This market is extremely firm, and a serious number of sellers are not offering.

BLEACHING POWDER is very quiet, but a few large orders are being placed.

COPPER SULPHATE.—There does not appear to be any improvement in the demand for this material, and prices have not been affected by the increase in the cost of the metal.

FORMALDEHYDE.—This material is still at a very high price, and only a moderate business is being transacted.

IRON SULPHATE (COPPERAS).—This material is moving off better at a price in buyers' favour.

LEAD ACETATE.—There is a very steady demand for this product, and some important export orders have been taken for the English makes.

LITHARGE.—Orders are now coming in very freely, and some makers are now unable to make immediate delivery.

LITHOPONE.—The market for this product is again firmer, and higher prices have to be made for near delivery.

POTASSIUM BICHROMATE.—Active business is being transacted in this product, especially on export account.

POTASSIUM PERMANGANATE is scarce on the spot, but the price is likely to be lower in the immediate future.

POTASSIUM NITRATE.—An active business is passing in this article, and sellers are well sold ahead.

POTASSIUM PRUSSIATE.—This article is very active, and the price is quite firm.

SODIUM ACETATE is weaker, and very little business is passing.

SODIUM CAUSTIC.—Only a very moderate business is being transacted; the American producers are competing very keenly for export orders.

SODIUM NITRATE.—This material is lower in price and slow of sale.

SODIUM PRUSSIATE is very active, and it is not easy to see how the price can decline much further.

SODIUM SULPHIDE is steady, and a slightly better business is being done.

ZINC SALTS are in slightly better demand, but OXIDE is lower.

Heavy Coal Tar Products

The market is still unsteady owing to the uncertainty of coal supplies, but there is a fair amount of business passing and prices generally are well maintained.

BENZOL.—Business has again been done at 1s. 9d. per gallon for export, and the home trade prices remain fairly steady.

CREOSOTE.—There is a fair demand, and business has been done at 5¼d. to 5½d. per gallon in the Midlands and North, and at a little under 6d. per gallon in London.

CRESYLIC ACID.—The market is quiet, with sellers at 2s. to 2s. 3d. per gallon.

NAPHTHALENE.—The demand is slow, but prices are unchanged at £5 to £6 for crude and £17 to £19 for refined.

SOLVENT NAPHTHA.—There is more activity, and a moderate amount of business has been done. Quotations are unchanged at 1s. 9d. to 2s. in the North and 2s. 1d. to 2s. 3d. in London.

PITCH.—The demand is still good, and as high as 72s. 6d. per ton has been paid f.o.b. East Coast.

Sulphate of Ammonia

The outlook regarding future supplies is still obscure, and there is some doubt as to the quantity which will be available for export. Meanwhile prices are unchanged.

French Market Report

Business in France during the last month has improved, but it would be very wide of the mark to describe it as satisfactory, and it is now pretty evident that a general resumption of trade cannot be expected until September at the earliest.

The Exchange question is having a retarding effect on commercial activities, while the factories in the north of France will not be able to work at full capacity for some time to come.

ACID LACTIC.—A fair business is being transacted at approximately 225 francs per 100 kilos.

ACID SALICYLIC has become very active of late, and the value may be taken at about 6 francs per lb.

ALUMINA SULPHATE is very quiet, and the bulk of the French demand can be supplied from local works.

AMMONIA SALTS are quiet, with the exception of Chloride, which is in request at about 225 francs per 100 kilos. Moderate business is being transacted in Ammonia Phosphate, but there are fair stocks in the country.

BARIUM SALTS are stagnant, and there is no feature to report.

EPSOM SALTS.—Only a very moderate business is being transacted.

LEAD SALTS.—A fair trade has been done both with the English and American makes.

LITHOPONE.—Some important orders have been placed for the American article, and the value to-day is about 150 francs per 100 kilos.

NAPHTHALENE SALTS are idle, and there does not appear to be any likelihood of a revival for some time to come.

POTASSIUM SALTS.—The market is nervous, and trade is only proceeding on a day to day process.

SODIUM SALTS are in the main very quiet and without feature. A small business has been transacted for Arseniate and Bichromate, and a few orders for English make Bisulphite have been placed.

SODIUM HYPOSULPHITE is in fair demand.

COAL TAR PRODUCTS.—Buyers are only purchasing their immediate requirements, and no large contracts have been placed recently.

Current Prices

Chemicals

July 31, 1919.

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	3	0	to	0	3	3
Acetone oil	ton	75	0	0	to	80	0	0
Acetone, pure	ton	95	0	0	to	97	0	0
Acid, Acetic, Glacial, 99-100%	ton	82	0	0	to	84	0	0
Acetic, 80% pure	ton	63	0	0	to	65	0	0
Arsenic	ton	50	0	0	to	52	0	0
Boric, cryst	ton	72	0	0	to	73	0	0
Carbolic, cryst. 39-40%	lb.	0	0	8	to	0	0	8½
Citric	lb.	0	4	4	to	0	4	5
Formic, 90%	ton	125	0	0	to	130	0	0
Gallic, pure	lb.	0	6	0	to	0	6	3
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	66	0	0	to	68	0	0
Lactic, 60 vol.	ton	82	0	0	to	85	0	6
Nitric, 80 Tw.	ton	31	0	0	to	33	0	0
Oxalic	lb.	0	1	2½	to	0	1	3
Phosphoric, 1.5	ton	45	0	0	to	48	0	0
Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	1	6	to	0	1	8
Salicylic, B.P.	lb.	0	2	1	to	0	2	3
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	2	9	to	0	3	0
Tartaric	lb.	0	3	3	to	0	3	4
Alum, lump	ton	17	10	0	to	17	15	0
Alum, chrome	ton	97	0	0	to	99	0	0
Aluminium, sulphate, 14-15%	ton	13	10	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	17	0	0	to	17	10	0
Ammonia, anhydrous	lb.	0	1	8	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	6½	to	—		
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)		48	0	0	to	50	0	0
Ammonia, nitrate	ton	55	0	0	to	57	10	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Ammonia, sulphocyanide	lb.	0	2	0	to	0	2	2
Amyl, acetate	ton	215	0	0	to	220	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate	ton	11	0	0	to	12	0	0
Barium, carbonate, 92-94%	ton	12	0	0	to	13	0	0
Chloride	ton	25	10	0	to	26	10	0
Nitrate	ton	51	0	0	to	52	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	13	0	0	to	13	10	0
Borax crystals	ton	48	0	0	to	50	0	0
Calcium acetate, grey	ton	20	0	0	to	21	0	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	8	10	0	to	9	0	0
Carbon bisulphide	ton	53	0	0	to	54	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide	lb.	0	7	9	to	0	8	0
Copper chloride		—				—		
Sulphate	ton	45	0	0	to	46	0	0
Cream of tartar, 98-100%	ton	235	0	0	to	240	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde	ton	122	10	0	to	125	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	3	0	0	to	3	5	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	32	0	0	to	34	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	82	10	0	to	85	0	0
Lead nitrate	ton	57	0	0	to	58	0	0
Litharge		—				—		
Lithophone, 30%	ton	44	0	0	to	45	0	0
Magnesium chloride	ton	15	0	0	to	16	0	0
Carbonate, light	cwt.	3	0	0	to	3	5	0
Sulphate (Epsom salts commercial)		11	10	0	te	12	10	0
Sulphate (Druggists')		17	0	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 0.1% acetone	gall.	0	9	0	to	0	9	6
Nickel ammonium sulphate, single salt	ton	47	10	0	to	52	10	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	95	0	0	to	97	10	0
Chloride	ton	Nominal						
Chlorate	lb.	0	1	2	to	0	1	3
Meta-bisulphate, 50-52%	ton	210	0	0	to	220	0	0
Nitrate refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	3	6	to	0	3	9
Prussiate red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	1	9	0	to	0	1	10
Salammoniac, firsts	cwt.	4	0	0				
Seconds	cwt.	3	15	0				
Sodium acetate	ton	52	0	0	to	55	0	0
Arsenate, 45%	ton	48	0	0	to	50	0	0
Bicarbonate	ton	9	0	0	to	9	10	0
Bichromate	lb.	0	0	8	to	0	0	8½
Bisulphite, 60-62%	ton	29	0	0	to	30	0	0
Chlorate	lb.	0	0	8	to	0	0	8½
Caustic, 70%	ton	19	0	0	to	20	10	0
Caustic, 76%	ton	23	10	0	to	24	0	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	17	10	0	to	18	10	0
Nitrite, 96-98%	ton	56	10	0	to	57	10	0
Phosphate, crystal	ton	25	10	0	to	26	10	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	0	7¾	to	0	0	8
Sulphide, crystals	ton	15	10	0	to	16	0	0
Sulphide, solid, 60-62%	ton	22	0	0	to	24	0	0
Sulphite, cryst.	ton	11	0	0	to	11	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate	ton	8	0	0	to	10	0	0
Sulphur chloride	ton	38	0	0	to	40	0	0
Flowers	ton	22	0	0	to	24	0	0
Roll	ton	21	0	0	to	23	0	0
Tin perchloride, solution		0	1	6	to	0	1	9
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride, crystals	lb.	0	1	8	to	0	1	9
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	80	0	0	to	85	0	0
Oxide, 94-95%	ton	60	0	0	to	62	10	0
Dust, 90%	ton	70	0	0	to	72	10	0
Sulphate, 99%	ton	21	10	0	to	23	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	6	to	0	2	9
Aniline oil, drums free	lb.	0	1	2	to	0	1	3
Aniline salts	lb.	0	1	3½	to	0	1	4
Anthracene, 85-90%	lb.	0	1	3	to	0	1	4
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	3	9
Benzidine, base	lb.	0	5	6	to	0	6	0
Benzidine, sulphate	lb.	0	4	9	to	0	5	0
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	1	9	to	0	2	0
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	8	0
Dinitrobenzol	lb.	0	1	4	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	2	to	0	1	3
Dinitronaphthaline	lb.	0	2	0	to	0	2	3
Dinitrotoluol	lb.	0	1	10	to	0	2	0
Dinitrophenol	lb.	0	1	10	to	0	2	0
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	0	to	0	3	3
H-Acid	lb.	0	7	6	to	0	8	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Naphthionic acid, crude	lb.	0	3	6	to	0	3	9
Naphthylamin-di-sulphonic acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	2	to	0	1	6
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	15	0	to	0	18	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	0	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor.	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	4	0	to	0	4	6
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	14	0	to	0	15	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic, anhydride	lb.	0	14	0	to	0	15	0
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salicylic acid	lb.	0	2	0	to	0	2	2
Salol	lb.	0	4	6	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	2	to	0	1	3
Toluidine, base	lb.	0	9	0	to	0	10	0
Toluidine, mixture	lb.	0	2	9	to	0	3	0

Miscellaneous and Paint Materials

Barytes	ton	12	0	0	to	14	0	0
Casein	ton	75	0	0	to	80	0	0
Chalk, precipated (ligh.)	ton	20	0	0	to	24	0	0
Chalk, precipated (heavy)	ton	10	0	0	to	12	0	0
China clay (bags extra) (f.o.r. Cornwall)	ton	1	12	6	to	3	12	6
Coke (blast furnace)	ton	3	15	0	to	4	0	0
Coke (foundry)	ton	3	15	0	to	4	5	0
Fuller's Earth	ton	4	0	0	to	5	0	0
Lead, litharge flake	ton	42	10	0	to	45	0	0
Lead, red	cwt.	2	2	6	to	2	7	6
Lead, white	cwt.	2	10	0	to	2	15	0
Ultramarine	ton	80	0	0	to	100	0	0
Prussian Blue	cwt.	11	0	0	to	11	10	0
Chrome green	cwt.	6	5	0	to	6	10	0
Chrome yellow	cwt.	6	5	0	to	7	0	0
Mineral black	ton	8	0	0	to	10	0	0
Carbon black	lb.	0	1	3	to	0	1	6
Guignet's Green, 30%	lb.	0	1	5	to		—	

The following prices are furnished by Messrs. Miles Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

Metals and Ferro-Alloys

Aluminium, 98-99%	ton	150	0	0				
Antimony (English)	ton	43	0	0	to	44	0	0
Copper, best selected	ton	110	0	0	to	112	0	0
Ferro-chrome, 60%	ton	55	0	0	to	56	0	0
Ferro-manganese, 76-80%	ton	25	0	0	to	26	0	0
Ferro-silicon, 45-50%	ton	22	0	0	to	25	0	0
Ferro-tungsten, 75-80%	lb.	0	3	0	to	0	3	1
Lead (ingot)	ton	24	10	0	to	24	12	6
Lead (sheets)	ton	33	0	0	to	34	0	0
Nickel, 98-99%	ton	205	0	0	to	206	0	0
Tin	ton	270	0	0	to	271	0	0
Zinc (spelter)	ton	42	10	0	to	43	10	0

Structural Steel

Angles and tees	ton	17	5	0	to	18	0	0
Flats and rounds	ton	21	0	0	to	21	10	0
Joists	ton	17	15	0	to	18	0	0
Plates	ton	19	15	0	to	20	5	0
Rails, heavy	ton	16	10	0	to	17	0	0
Sheets, 24 G. black	ton	23	0	0	to	24	0	0
Sheets, galvanised corrugated	ton	30	0	0	to	31	0	0

Building Materials

Bricks, stock	1000	3	16	0	to	3	17	0
Bricks, blue Staffs	1000	8	0	0	to	8	5	0
Firebricks, Stourbridge	1000	9	2	6	to	9	5	0
Fireclay, Stou bridge	ton	1	17	0	to	1	18	6
Glass, sheet, 21oz.	ft.	0	0	8½	to	0	0	8¾
Lime, ground blue Lias	ton	2	5	0	to	2	7	6
Lime, grey stone	ton	2	13	0	to	2	15	0
Linseed oil, boiled	gall.	0	12	6	to	0	13	0
Linseed oil, raw	gall.	0	11	9	to	0	12	6
Portland cement	ton	3	11	0	to	3	13	0
Slates, Bangor	1200	32	0	0	to	35	0	0
Slates, Portmadoc	1200	18	0	0	to	25	0	0
Tiles	1000	6	2	6	to	6	5	0
Turpentine	gall.	0	8	0	to	0	8	6
Yellow pine up to 3×8	standard	45	0	0	to	55	0	0
Yellow pine over 3×8	standard	50	0	0	to	60	0	0

The *Nieuwe Rotterdamsche Courant* learns that an agreement has been made between an important British syndicate and the Dutch trading company, Messrs. Blass & Groenewegen, of Utrecht, with the object of making wholesale purchases of German metal products for immediate export to England. This transaction, it is added, is of great importance for Dutch commerce, because it is apparent that through the continuous rise of the American rate of exchange on London, and the increasing difficulties in industrial life in England British merchants have been compelled to apply for supplies of goods to the Continent.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations July 23	Quotations July 30
Alby United Carbide Factories, Lim., Ord.	1 1/16 – 1 1/16	1 1/16 – 1 1/16
Associated Portland Cement Manufrs. (1900.) Lim., Ord.	7 9/16 – 7 13/16	7 11/16 – 7 15/16
Bell's United Asbestos Co., Lim., Ord.	1 15/16 – 2 1/16	1 15/16 – 2 1/16
Bleachers' Association, Lim., Ord.	1 5/16 – 1 3/8	1 11/32 – 1 13/32
Borax Consolidated, Lim., Prefd. Ord.	4 1/4 – 4 3/4	4 1/4 – 4 3/4
Bradford Dyers' Assoc. Lim., Ord.	2 5/16 – 2 7/16	2 5/16 – 2 5/16
British Aluminium Co., Lim., Ord.	1 9/16 – 1 11/16	1 9/16 – 1 11/16
British Oil and Cake Mills, Lim., Ord.	2 7/32 – 2 9/32	2 7/32 – 2 9/32
British Portland Cement Manufrs., Lim., Ord.	31/6 – 33/6	31/6 – 33/0
Brunner, Mond & Co., Lim., Ord.	2 – 2 1/16	2 3/32 – 2 5/32
Castner-Kellner Alkali Co., Lim.	2 5/8 – 2 7/8	2 5/8 – 2 7/8
China Clay Corporation, Lim., Ord.	1/4 – 3/8	1/4 – 3/8
Cook (Edward) & Co., Lim., 4% 1st Mort. Deb. Stock Red.	57–61	57–61
Courtaulds, Lim.	10–10½	9 3/4 – 10 1/4 xd
Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefce.	7/8 – 1 1/8	7/8 – 1 1/8
Curtis's & Harvey, Lim.	2 9/16 – 2 13/16	2 9/16 – 2 13/16
Explosives Trades, Lim., Ord.	20/6 – 21/6	20/9 – 21/9
Field (J. C. & J.), Lim., Ord.	7/16 – 9/16	7/16 – 9/16
Greenwich Inlaid Linoleum (Fredk Walton's New Patents) Co., Lim., Ord.	1/2 – 5/8	1/2 – 5/8
Harrison & Crosfield, Lim., 10% Cum. Prefd. Ord.	1 31/32 – 1 15/16	1 31/32 – 1 15/16
India Rubber, Gutta Percha and Tel. Wks. Co., Lim., Ord.	17 1/4 – 17 3/4	17 1/4 – 17 5/8
Lawes' Chemical Manure Co., Lim., Ord.	6–6½	6–6½
Lever Bros., Lim., 6% Cum. "A" Pref.	19/3–19/9	19/4½ 19/10½
Do. 6½% Cum. "B" Pref.	19/10½ 20/4½	19/10½ 20/4½
Magadi Soda Co., Lim., Ord.	1 1/16 – 1 3/16	1–1 1/8
Manganese Bronze and Brass Co., Lim., Ord.	11/16 – 13/16	11/16 – 13/16
Maypole Dairy Co., Lim., Defd. Ord.	1 1/4 – 1 5/16	1 1/4 – 1 5/16
Mond Nickel Co., Lim., 7% Cum. Pref.	1 3/16 – 1 3/16	1–1 1/8 xd
Do. 7% Non. Cum. Pref.	15/16 – 1 1/16	15/16 – 1 1/16 xd
Pacific Phosphate Co., Lim., Ord.	5 1/2 – 5 5/8	5 1/2 – 5 5/8 xd
Power-Gas Corporation, Lim., Ord.	3/4 – 7/8	3/4 – 7/8
Price's Patent Candle Co., Lim.	38–40	38–40
Salt Union, Lim., Ord.	1 1/4 – 1 3/8	1 29/32 – 1 31/32
United Alkali Co., Lim., Ord.	1 1/4 – 1 1/2	1 1/4 – 1 1/2
Val de Travers Asphalte Paving Co., Lim.	15/16 – 1 1/16	15/16 – 1 1/16
Van den Berghs, Lim., Ord.	3 5/8 – 3 3/4	3 5/8 – 3 3/4
Walkers, Parker & Co., Lim.	1 31/32 – 1 15/16	1 31/32 – 1 15/16
Welsbach Light Co., Lim.	2–2 1/4	2 1/8 – 2 3/8

Gas, Iron, Coal and Steel

Gas Light and Coke Co., Ordinary Stock (4% Stand.)	54–56	51–54 xd
South Metropolitan Gas Co., Ordinary (4% Stand.)	53–56	53–56
Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.	1 1/4 – 1 5/16	1 29/32 – 1 31/32 xd
Hadfield's, Limited, Ordinary	1 27/32 – 1 29/32	1 27/32 – 1 29/32 xd
Staveley Coal & Iron Co., Lim., Ord.	1 11/16 – 1 13/16	1 11/16 – 1 13/16
Vickers, Limited, Ordinary	34/0–35/0	35/0–36/0
Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	34/0–35/9	34/6–35/6

Mines, Nitrate, &c.

Rio Tinto Co., Lim., Ord. (Bearer)	61–62	61–62
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5½% 1st. Mt. Debs. Red.	88–93	88–93
Lagunas Nitrate Co., Lim.	1 1/8 – 1 3/8	1 1/8 – 1 3/8
Tarapacá and Tocopilla Nitrate Co., Lim.	14/6–15/6	14/6–15/6
Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	13½–14½	13½–14½

Oil and Rubber

Anglo-Persian Oil Co., Lim., Cum. 6% Part.	1 5/16 – 1 3/8	1 29/32 – 1 31/32
Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary	8 7/16 – 8 13/32	8 5/8 – 8 3/4
"Shell" Transport and Trading Co., Lim., Ord.	7 7/8 – 8 d	9 3/32 – 9 7/32
Do. 5% Cum. Pref.	9 1/8 – 9 3/8	9 1/8 – 9 3/8
Anglo-Java Rubber & Produce Co., Lim.	5/10½ – 6/4½	5/10½ – 6/4½
Anglo-Malay Rubber Co., Lim.	12/7½ – 13/1½	12/7½ – 13/1½
Chersonese (F.M.S.) Estates, Lim.	3/7½ – 3/10½	3/7½ – 3/10½
Linggi Plantations, Lim., Ord.	.. ..	.. ..
Anglo-Maikop Corporation, Ltd., Ord.	6/9–7/9	5/6–6/6
Burmah Oil Co., Ltd., Ord.	11–11¼	13⅜–13⅝

The Indian Market

Increasing Trade with Japan and U.S.A.

(From Our Own Correspondent.)

One of the most remarkable features of India's import trade has been the remarkable increase in trade with Japan and the United States. The pre-war average of imports was Japan 2½ per cent. and United States 3 per cent. In the last return Japan had increased to 12 per cent., or £12,175,000, and the United States to 8 per cent., or £7,876,000. As regards the exports of Indian merchandise, the pre-war average was Japan 7½ per cent. and United States 3 per cent. In the last official returns Japan's purchases from India were 14 per cent., or £22,774,000, and United States 12½ per cent., or £20,378,000. This remarkable development is still extending. An International Exposition of Asiatic Products is to be held in New York City in the spring of 1920, and Indian firms are invited to exhibit. Exporters in Britain may note the activity of Japan and the United States.

Currency and Trade Developments

The Government of India has appointed a Currency Committee to inquire into the future exchange and currency policy. Local merchants' opinion is that if the rupee is to follow the price of silver there is no guarantee as to what height exchange might not rise to; and, if the alternative is an inconvertible paper currency, it is better to face it. Another Government proposal is the registration of business names on the lines of the United Kingdom Act. Many favour also an Act for the registration of partnerships, a matter of considerable interest to British shippers.

Notwithstanding the powerful aid of trade journals to British industries and the assistance well-informed trade correspondents give, there are still traders who rely on Government aid to make trade prosperous. An important English industry has suggested that the Government should despatch at once a commission to India, China, Japan, the United States, and the Far East to inquire into the question of securing orders for the industry and to extend the same. Artificial assistance of this kind is regarded as of very little practical worth.

Great activity prevails in Indian industrial and engineering circles. Last year Calcutta imported:—Metals and ores, value Rs. 85,010,237; oils, Rs. 19,856,474; machinery, Rs. 21,550,233; perfumery, &c., Rs. 11,929,506; chemicals, Rs. 10,935,277; apparatus and appliances, Rs. 9,006,748; drugs and medicines, Rs. 4,577,610; soap, Rs. 1,926,105; paper-making materials, Rs. 1,113,171.

Among the principal minerals mined in Burma last year were: Block tin, 100 tons, value Rs. 421,854; potters' clay, 26,271 cwt., Rs. 21,440; laterite, 162,428 tons, Rs. 162,661; petroleum, 274,834,556 galls., Rs. 16,216,922; silver lead ore, 50,679 tons, Rs. 5,789,553; tin ore, 222 tons, Rs. 535,299; wolfram, 383 tons, Rs. 811,516.

During April the United Kingdom shipped to India 556 cwt. alum and 5,188 cwt. aluminous sulphates. During the same month India imported:—Chemicals, value Rs. 2,714,436; machinery, Rs. 7,358,983.

For the three months January-March the quantity of salt cleared at the Customs was 3,476,150 maunds, or 39 per cent. more than the same period last year. (An Indian maund equals 82 2-7 lb. Avoid.)

On May 13 the Indian Government issued the regulation with reference to the exports of mica:—"(1) Exports of mica of all descriptions are permitted under licence to the United Kingdom as at present; (2) exports of all sizes and qualities of mica splittings and block, other than first and second qualities of clear and slightly stained ruby block of all sizes, are permitted under licence to other British and to Allied destinations."

Paper Pulp from Elephant Grass

The chemical side of the possibilities of obtaining paper pulp from the elephant grasses in Assam has received official attention. The area covered is about 31,600 acres. The most important species of grass found in this area are:—(1) Khagra (saccharum spontaneum); (2) batta (saccharum narenga); (3) nal (phragmites karka). The cost of extracting air-dried grass worked out:—Khagra, Rs. 7.8; batta, Rs. 6.2; nal, Rs. 8.8 per ton. The yield is about 3 tons per acre per annum, which gives 33 per cent. of pulp. The pulp bleached to a good white colour with only 2 1-5 per cent. loss in weight by the use of 5.7 per cent. of bleaching powder.

Chambers of Commerce and German Trade

The Bengal Chamber of Commerce has confirmed the new articles of association which were adopted by an extraordinary general meeting on May 30. The new articles substitute three for the two existing classes of members, these being Chamber members, associate members, and honorary members. In future only British subjects are to be eligible for election as Chamber members, while non-British subjects, who are not subjects of enemy countries, are eligible for election as associate members. No subject of an enemy country is eligible for membership as an associate member for a period of ten years, and only then provided that three-fourths of the Chamber members present at a meeting called for the purpose agree. Further, any firm, whether a Chamber or an associate member, is to cease to be a member if it takes in an enemy subject as partner, director, agent or manager. The effect of these new articles is, of course, to isolate any German firm which has the temerity to begin operations in Bengal within the next few years. It is presumed that similar steps will be taken by other Chambers of Commerce, most of which have already in general terms condemned German "enterprise" in India.

Clay Cross By-Products Plant

Visit of Derby Engineers

By the invitation of General Jackson, the Derby Society of Engineers on Saturday visited the Clay Cross By-Product Plant. They were met by Mr. Delmonty, the manager, who explained various branches of the plant, from the charging of an oven with slack, to the extraction of Chemicals from Sulphate of Ammonia to benzol.

The engineers also inspected the oil-well borings at Heath and Hardstott, and, although drilling was not in operation, Mr. Victor L. Conaghan, superintendent of the Mexican drillers, was present to explain the system of working. At the Heath No. 1 well, where a depth of 1,930 ft. has been reached without striking oil, the party saw at work a gas-fired boiler, generating steam by means of natural gas escaping from the bore hole. The fixing of the boiler had been completed that day, and when work is resumed, the drilling plant will be operated by steam produced from the waste gas. At Hardstott the boring has been carried down to 3,130 ft. and the visitors saw the oil bubbling up to the surface and then being conveyed by iron pipes to the great tank of 200,000 gallons capacity, which is now in use. The flow still remains at 400 gallons per 24 hours, but it is hoped to augment this when the pump arrives. The pump will be of the beam type and all the connections have been made for immediate coupling up. The oil is now coming up under a gas pressure of 1,100 lb. to the inch, and the effervescence which takes place at the well mouth gives one the impression of boiling oil.

Importation of Chemicals under License

The department of Import Restrictions publishes the first list of chemical products for which general import licenses have been issued:—

Acetate of iron; acetate of lime; acetone; alum; aluminium acetate; aluminium sulphate; ammonia hydrate; ammonium carbonate; ammonia chloride; ammonia chlorate; ammonia nitrate; ammonia phosphate; ammonia sulphate; baryta; bleaching powder; boracite; borate of lime; borate of manganese; borax; boric acid; brimstone; calcium carbide, carbon bisulphide; carbonic acid; chloroform; chromic acid; cinchonic salts; cinchonidine salts; citrate of lime; citric acid; copper sulphate; cream of tartar; epsom salts; ether; ferrous sulphate; formaldehyde; fusel oil; gelatine, photographic; glycerine; hydochloric acid; hydrofluoric acid; iodine; lactic acid; lead acetate; lead nitrate; lithia carbonate; magnesia; magnesium chloride; magnesium sulphate; manganese dioxide; menthol crystals; mercurial salts; methyl ethyl ketone; nitric acid; oxalic acid; phosphoric acid; picric acid; quinidine salts; quinine salts, other than sulphate; quinoidine; sal acetos; soda ash; soda, aluminate; soda, bicarbonate; soda, caustic; soda, chloride; soda, crystals; soda, nitrate; soda, nitrite; soda, silicate; soda, sulphate; soda, sulphide; sulphuric acid; tartar emetic; tartaric acid.

Company News

ANGLO-BOLIVIAN RUBBER ESTATES, LTD.—At the adjourned ordinary general meeting Mr. W. R. Gaff (chairman) said that the important matter which they had to consider was the purchase of a new estate—a very large estate which had great advantages, and which was in the neighbourhood of their present estate. The purchase had been brought about by Mr. Dutchman, a shareholder, while he was on a visit to the company's property. Had Mr. Dutchman not brought about this purchase the estate would undoubtedly have fallen into the hands of the Germans, who would have competed with the company in the labour market to a very serious extent. The new estate would give them an increased production of rubber and open up new spheres for trading, but the greatest advantage was that they would be able to get their rubber from their own estates by waterways, with the exception of a short railway journey to avoid the falls on the Amazon. This would materially reduce the cost of freightage. The present estate was one of 14,000 square miles, and, with the new estate, they would have 5,600 square miles altogether. At an extraordinary general meeting it was decided to increase the capital to £125,000 by the creation of 1,250,000 new shares of 1s. each.

BOLIVAR CONCESSIONS (1917).—At the first annual general meeting of the company, the chairman said that vast concessions had been acquired from, and others were being negotiated with the Governments of a number of Mid-Central American Republics and private owners. These concessions stretch from the frontier of Mexico right away to Brazil, forming an almost uninterrupted chain of concessions and properties encircling approximately two-thirds of the Caribbean Sea, with numerous ports on the Atlantic and Pacific Oceans. The areas comprised in these great possessions already amount to over 18,000,000 acres, and will at the conclusion of satisfactory negotiations, now in progress with various Republics, exceed this figure many times over. It was not to be assumed that such vast areas would all contain oil, or, even if they did, in highly commercial quantities, but large areas were already known to do so. The greatest care was being taken to ascertain which areas are likely to be most lucrative for the operations of the British Controlled Oilfields (Limited), and various expeditions had been sent to Mid-Central America, and were at present operating and investigating there, under the leadership of some of the most eminent British oil engineers and geologists, with fully-equipped staffs to assist them in arriving at these conclusions. The prospects were that at no far distant date the British Controlled Oilfields (Limited) would control an oil-producing position unequalled in the oil-world.

BRITISH NORTH BORNEO RUBBER TRUST.—At the annual meeting a dividend was declared of 6 per cent., less income tax.

BRITISH WINDOW GLASS.—An issue is about to be made by the British Window Glass Company of 400,000 8 per cent. cumulative participating preference shares of £1 each at par.

CHARING CROSS, WEST END AND CITY ELECRICITY SUPPLY CO.—Interim dividend on the ordinary shares of the West-end undertakings for the half-year ended June 30th at the rate of 4 per cent. per annum. A year ago no interim was paid on these shares.

EBBW VALE STEEL, IRON, AND COAL.—At the annual meeting of the company, the chairman, in reviewing the year's operations, stated that another extension had taken place in regard to by-product coke ovens and in regard to blast furnaces. They were spending practically a million on two new blast furnaces, one of which was nearly approaching completion. This plant would not have its equal in this country, and it would add approximately 50 per cent. to their largest pre-war output of iron and steel. They would be self-contained—he believed the only self-contained iron and steel works in Great Britain. "We shall possess our own native iron ore, our own native limestone quarries and dolomite quarries; we shall produce all the coal we require, and all the coke and pig-iron in order to make the finished output of steel. No place in this country will be better situated than we are if the Government and the people in general will leave us alone."

LOCHGELLY IRON AND COAL.—The accounts as at May 31st last show, after deducting depreciation and making provision for excess profits duty, &c., a profit of £101,093. The directors recommend a dividend on the ordinary shares of 3s. 6d. per share (subject to tax); £25,000 to reserve; and forward £54,685, against £48,592. The amount payable for excess profits duty and coal mines excess payments cannot meantime be definitely ascertained. The provision made for these payments is estimated, and is believed to be sufficient. Prices obtained during the year for sales in the home market have been unremunerative, and the profits made have been mainly earned from export sales at high prices.

NEW PACCHA AND JAZPAMPA NITRATE COMPANY.—The directors have decided to offer 11,450 shares of £1 to proprietors in the proportion of one new share for every five now held, at £2 per share.

OILFIELDS OF ENGLAND.—In the prospectus of Oilfields of England, Ltd., inviting subscriptions for 170,000 ordinary shares of £1 each at par, it is stated that the company has been formed to acquire petroleum rights over oil-bearing lands in England, and to put down oil wells with proper equipment with the object of carrying on the business of a producer oil company on a commercial basis. The Government have granted to the Company a licence to bore for and produce petroleum oil within an area known as the Kelham Estate, situated near Newark, in the county of Nottingham. This area comprises approximately eight square miles of territory. A bore has already been put down on the estate, and true normal petroleum in crude liquid form is stated to have been proved at a depth of 2,440 feet, contained in a petroliferous band of coarse sandstone about 13 feet in thickness.

ROUMANIAN CONSOLIDATED OILFIELDS.—In a circular to the shareholders of the Roumanian Consolidated Oilfields, the directors state with reference to the company's claim of £1,270,725 sent in to the British Government in 1917, that, as all overtures with the object of inducing the Goverment to settle proved unavailing, the directors, took proceedings by petition of right to recover the amount of the claim. The case has been set down for trial for some months past; but, owing to so many of the judges being otherwise engaged, it is very improbable the case can be reached before the autumn. In the meantime, it is urgently necessary that the company should be provided with funds for the purchase of a considerable quantity of new machinery and plant, and for proceeding with the work of development; and the directors have decided to make an issue of shares and to offer 300,000 £1 shares to the existing shareholders for subscription *pro rata* with their present holdings. They have also agreed with the Oilfields Finance Corporation to underwrite 200,000 shares of this issue at a commission of 1s. per share, together with the call at par until December 30, 1920, of the balance (if any) unapplied for of the 300,000 shares.

RUSSIAN OIL AMALGAMATION.—At meetings this week resolutions were passed by the Bibi Eibat Oil Co. and the Russian Petroleum Co. (Ltd), approving the scheme for the amalgamation of several companies interested in Russian oil.

SHAWINIGAN WATER AND POWER.—At a meeting last week, it was stated that the company during the war embarked on a number of industrial enterprises outside the usual scope of their operations, and had utilised their plant for the manufacture of magnesium, acetone, acetic acid, and calcium carbide, required for the Ministry of Munitions. Referring to the importance of water for the production of power, the chairman said the company was in the happy position of owning water-powers with indisputable rights on the St. Maurice River at Shawinigan Falls and the Gres Falls, and, further, controlled the power from the development at Grand' Mère, owned by the Laurentide Power Company. At present the combined generating capacity of this development was 330,000 h.p. With the flow of the St. Maurice River regulated by the great storage basin at La Loutre Dam, the generating capacity of these two plants would be about 480,000 h.p., and a future development at Gres Falls would raise this to over 600,000 h.p. These three power plants, located within 18 miles of each other on the St. Maurice River, controlled and operated by one company, form a very strong power centre.

SOUTH METROPOLITAN GAS.—The report for the half-year ended June 30th states that, after providing for interest and other charges, including the maximum dividend on the Ordinary stock authorised by the Statuotry Undertakings (Temporary Increase of Charges) Act of last year, namely, 3 per cent. per annum, there remains a balance of £6,633 to be carried forward. The cost of wages is more than double that of the corresponding half-year of 1914, while coal is two and a-half times dearer. The company's overseas trade is still hampered by official restrictions, the export of valuable by-products being held up by regulations which are quite inappropriate to peace conditions. At the request of the Board of Trade the Fuel Research Board of the Department of Scientific and Industrial Research have recently conducted an investigation into the composition and quality of gas which should be supplied. Their work and conclusions have been recorded in a report recently issued by the Department. Accepting this report in its entirety, the directors propose to ask the assent of the proprietors to the promotion of a Bill embodying the recommendations made. It is intended to ask at the same time for a new sliding scale applicable to the changed conditions.

STANDARD OIL CAPITAL.—The Standard Oil Company of New Jersey announces that it is proposed to increase the capital stock by a hundred million dollars (£20,000,000), thus practically doubling the present capital. The new capital will consist of Seven per cent. Preferred Stock, which will not carry with it voting powers; it will be offered to present shareholders at par. Messrs. Morgan's will underwrite the issue, which will be listed on the Stock Exchange. The issue will be used to provide for "the vigorous prosecution and development of the campaign which the company planned during the war and launched immediately the Armistice was declared," including the future supply of crude oil, the enlargement of refining facilities, and the extension of transportation and distributing plant.

UNITED ALKALI.—Interim dividend of 1s. per share on the Ordinary shares, the same as a year ago, and 7s. per share on Preference shares, both less tax.

VICKERS, LTD.—Interim dividend for the half-year ended June 30 last of 1s. per share (free of income-tax up to 5s. in the £) on the ordinary shares, the same as a year ago. The dividend will be posted on Aug. 30.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

LONDON GAZETTE

Partnerships Dissolved

SHEWELL, Albert Bevington, and HARGREAVES, Henry, chemists and druggists, Gloucester, under the style of Hargreaves & Shewell, as from July 1, 1919, by mutual consent.

LINELL, Herbert John, and FRAM, Albert Edward, manufacturing chemists, &c., 176, Mary Street, Balsall Heath, Birmingham, under the style of Linell & Fram, as from July 25, 1919, by mutual consent. All debts received and paid by Herbert John Linell, who will carry on the business at the above address.

Liquidator's Notice

WHITE ROCK CHEMICAL CO., LTD. (in voluntary liquidation) — A general meeting of members will be held at the offices of John Tonge, 22, Booth Street, Manchester, on September 4, 1919, at 3 p.m. J. Tonge, Liquidator.

Mortgages and Charges

PHOENIX CHEMICAL CO. (1919) LTD., E.C. (M. Aug. 2, 1919).— Registered July 22, mortgage or charge for securing all moneys due or to become due, but not exceeding £25,000, to the Manchester & Liverpool District Banking Co., Ltd.; general charge.

Satisfaction

BRITISH DYES LTD. Huddersfield, (MS. Aug. 2, 1919).—Satisfaction registered July 18, sums not exceeding £1,700,000, registered Oct. 18, 1916.

County Court Judgments

BERTON, Archibald Thomas, Redcroft, 6, Shalimarter, Horn Lane, Acton, chemist, &c. (CC. Aug. 2, 1919) £37 5s. 8d. June 18.

SENIOR, A. A., King Street, Southall, chemist (CC. Aug. 2, 1919), £10. 19s. 3d. June 18.

JAMES, John, 25, Hill Street, Pentre, Broughton, chemical employee (CC. Aug. 2, 1919), £18. 0s. 2d. June 18.

Bills of Sale

MARSON, Harry Charles, 171, Hampton Road, Ilford, chemical store-keeper (BS. Aug. 2, 1919). Filed July 23, £50.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

PAYNE BROTHERS, LTD., 107, Hannon Street, E.C. To carry on business of glass manufacturers, dealers in bottles, and glassware of every description. Nominal capital, £10,000 in 10,000 shares of £1 each. Directors: J. R. Payne, 17, Regent's Park Avenue, N.W. 1; M. T. Payne, 85, Bedford Court Mansions, W.C. 1; F. L. Payne, 134, Bedford Court Mansions, W.C. 1.

H. B. WARNEFORD & CO., LTD., Pit Lane Works, Chickenley Heath, Dewsbury, manufacturing chemists, drysalters, &c. Nominal capital, £3,000 in £1 shares. Directors: A. J. Riley, Soothill Lane, Batley; J. S. Riley, Soothill Lane, Batley; J. H Warneford-Bell, 108, Crackenedge Lane, Dewsbury; W. Gothard, 2, Broad Owler Lane, Ossett. Qualification of directors, 25 shares.

GEORGE LILLINGTON & CO., LTD., manufacturers of metallic liquids, &c. Nominal capital, £50,000 in 50,000 shares of £1 each. Minimum subscription, £3,000. Directors: G. Lillington, 116, Drayton Park, Highbury; W. Barron, 51, Parkholme Road, Dalston; J. H. Davison, 52–54, Southwark Street, S.E. Qualification of Directors, £500.

ESTE SYNDICATE, LTD., Talbot House, 9, Arundel Street, W.C. 2. To carry on the business of extracting, pumping, drawing, transporting and purifying and dealing in petroleum and other mineral oils, &c. Nominal capital, £1,200 in 1,185 shares of £1 each, and 300 shares of 1s. each. Directors: A. Simpson, 29, Heathfield Road, Mill Hill Park; W. K. Kershaw, "Merfod," 152, Middleton Hall Road, King's Norton. Qualification of directors, £100.

NORTH OF ENGLAND CHEMICAL WORKS, LTD., Sandstill Street, Berwick-upon-Tweed. Nominal capital, £25,000 in 25,000 shares of £1 each. Directors: J. T. R. Wilson, Bentarsen, Slateford, Midlothian; T. Darling, "Adderstone," Berwick-upon-Tweed; W. R. McCreath, Cheviot House, Berwick-upon-Tweed; A. Darling, "Bondington," Berwick-upon-Tweed; J. A. M. McCreath, Gainslaw, Verwick-upon-Tweed. Qualification of directors, £500.

RIGBY TAYLOR, LTD., Victoria Works, Gayside Street, Bolton. To carry on businesses of bleaching, dyeing and sizing materials, disinfectants, soaps, chemicals, &c. Nominal capital, £15,000 in 150,00 shares of £1 each. Directors: H. Rigby, Lyndene, Miletas Place, Fairhaven, near Lytham; R. S. Taylor, Cresgarth, Edington Road, Fairhaven, near Lytham. Qualification of directors, £100.

W. SUTTON & CO., DRUGGISTS SUNDRIES, LONDON, LTD., 76, Chiswell Street, Finsbury Square, E.C.1. Nominal capital £25,000 in 25,000 shares of £1 each. Directors: A. Tebbutt, 9, Waldgrove Gardens, Upminster; C. Andrewl 54, Hertford Road, East Finchley. Qualification of directors, 50 ordinary shares.

The Affairs of G. E. Heyl

A FURTHER sitting for the public examination of George Edward Heyl, King's House, Kingsway, W.C., a consulting chemical engineer, who had been interested in the manufacture of oils, was held at the London Bankruptcy Court on Friday, July 25, before Mr. Registrar Francke.

The statement of affairs disclosed an estimated surplus in assets of £228,910 after payment of all his liabilities, which amount to £77,760. According to the printed report of the Official Receiver, the debtor had stated that in October, 1916, a syndicate was registered which agreed to finance his undertaking for the manufacture of oils at Barking and Corton, near Weymouth, and in the following May a company was formed with a nominal capital of £1,000,000, to acquire his entire interests in his business and inventions there. He denies that he is insolvent, and attributes his present position to the alleged breach of all the agreements for the sale of his business.

Mr. Stollard, who appeared on behalf of the debtor, asked for a short adjournment. A passport had, he said, been issued enabling his client to go to Esthonia.

Upon his Honour expressing some surprise at this, Mr. Stollard said that he did not advise the debtor to go out of the Court's jurisdiction. As a matter of fact, he was unaware that the debtor would not be present that day. He knew that the debtor had been ordered by the Court to be present, but presumed that the Official Receiver would have received some notice had it been known that he would be absent.

The Registrar: You have no business to make any such assumption. You ought to see that a debtor obeys an order of the Court. The debtor is in contempt.

Mr. Stollard: Technically. He added that the debtor's absence was merely temporary, and it was possible that as a result of his journey he might be in a position to make some proposal for his creditors' benefit on his return.

The Official Receiver, under the circumstances, asked that the examination should be adjourned *sine die*.

His Honour granted the application of the Official Receiver, whom he asked to report to the Foreign Office that the granting of a passport to the debtor had placed the order of the Court at defiance.

The Registrar: It seems to me that passports are granted with very little inquiry when an undischarged bankrupt is allowed to leave the Court for such a remote place as Esthonia.

Explosion at a Chemical Works

On Wednesday in the King's Beach Division, Lord Justice Scrutton gave judgment in an action arising out of an explosion at Rainham, Essex, in Sept., 1916, which resulted in the death of some 6 or 7 workmen. The action was brought by the Belvedere Fish Guano Co., Ltd., against the Rainham Chemical Works, Ltd., and the point before the Court was to ascertain who was liable for the damages in respect of the disastrous explosion to plaintiff's premises. Mr. J. B. Matthews, K.C., and Mr. S. Stuart Bevan, K.C., appeared for the plaintiffs, and Mr. Douglas Hogg, K.C., and Mr. Maddocks, for the defendants.

The plaintiffs case was that as the result of the explosion, their premises were so damaged that they were put to an enormous expenditure and they sought to recover the same as damages.

Mr. Matthews said the explosion was one which had terrible results. Defendants were engaged in making high explosives, picric acid and D.N.P. On the occasion of the disaster a fire broke out which reached two barrels of explosives, and a serious explosion followed. The plaintiffs' manager, who was sitting in his room, was blown off his stool; the door of the room was blown out and great pieces of concrete came through the roof. Plaintiffs' offices were 150 yards away and these, and some cottages, were much damaged. Plaintiffs manufactured fish guano in works adjoining defendants' factory, and they said that their factory plant and machinery were seriously damaged, and that the defendants were liable. They also alleged negligence against defendants.

Defendants, by their defence, said they were acting as agents for the Ministry of Munitions in the manufacture of explosives. They denied that there was any danger, and denied being guilty of any negligence. Further, they said, as they were engaged by the Ministry of Munitions, and were acting for them, no action would be against them.

A mass of evidence was called on either side.

His Lordship found the defendants liable and referred the question of damages.

Notices

(Three lines, 3s.; each additional line, 1s.)

G. R.

By Direction of the Disposal Board Ministry of Munitions.

NOTE.—For detailed list of all surplus Government Property for Sale, apply at the nearest bookstall or to the Director of Publicity, Ministry of Munitions, for "Surplus," price 3d.

MINERAL JELLY FOR DISPOSAL.

THE Surplus Government Property Disposal Board invite tenders for about 500 tons Mineral Jelly lying at the Royal Gunpowder Factory, Waltham Abbey.

Full information, tender forms and samples may be obtained on application to the Controller. Explosives and Chemical Section (D.B.4.c.), Storey's Gate, Westminster, S.W.1.

G. R.

By Direction of the Disposal Board, Ministry of Munitions.

AT THE SOUTH METROPOLITAN GAS CO'S, WORKS, OLD KENT ROAD, LONDON, S.E.

To Chemical Manufacturers, Dye Works, Laundries, Engineers, Machinery Dealers and others.

HENRY BUTCHER & Co. have received instructions to sell by Auction on the above premises on Tuesday, August 26th, 1919, at 11 a.m., the EXTENSIVE PLANT and MACHINERY as used in the Manufacture of Synthetic Phenol comprising:

The nearly new KESTNER EVAPORATING PLANT complete with all the necessary Apparatus, Tanks, Tubes, Receivers, Condensers, etc., etc., capable of dealing with about 10,000 gallons Caustic Soda per diem, 100 H.P. HORIZONTAL STEAM CONDENSING ENGINE by Tangye, 9 CENTRIFUGAL HYDRO EXTRACTORS by Manlove and Elliott, 8 SULPHONATORS (about 800 gallons capacity), 6 REFLEX CONDENSERS fitted with 2 in. lead coils, 22 PITCH PINE VATS from 8 ft. to 10 ft. in diameter, assorted, lead lined and plain, and all fitted with Mixers and Gears complete, 8 GRINDING MACHINES (Follows and Bates) with wood hoppers, 2 3-ton "WAYGOOD OTIS" HYDRAULIC LIFTS complete, HYDRAULIC ACCUMULATOR weighted for a pressure of 650 lbs. per square inch, 2 3-ton PLATFORM WEIGHBRIDGES (Averys), 22 C. I. FUSION POTS, 3 ft. 6 in. × 4 ft. 3 in., fitted with stirrers, bafflers, and gear complete, 4 M. S. RIVETTED STILLS 6 ft. × 10 ft. deep, 8 C. I. EVAPORATING PANS 8 ft. × 6 ft. fitted with stirrers and gear, HYDRAULIC PRESS, 400 W. I. TRAYS 4 ft. × 2 ft. with lifting handles.

The following Plant by Messrs. GREENWOOD & BATLEY:

DISTURBING PAN fitted self-contained Driving Gear, 2 HYDRAULIC MOULDING MACHINES, 4 SELF-FLUSHING ANGLO PRESSES, DOUBLE PARING MACHINE. Set No. 5 HYDRAULIC PUMPS, HIGH PRESSURE ACCUMULATOR, 4 in. RAM.

Also large quantities Steel Shafting Pulleys, Bearings, Belting Pumps, Lifting Tackle, Tools, Valves, Cocks, Fittings, Bricks, Timber, Steel Joists, etc., etc.

On view one week preceding Sale from 10 a.m. to 4 p.m. and morning of Sale.

Catalogues and all information from Henry Butcher & Co., Plant and Machinery, Valuers and Auctioneers, 63 and 64, Chancery Lane, London, W.C.2. 'Phone: Holborn 2295.

For Sale or Wanted

(Three lines, 3s.; each additional line, 1s.)

INCOME TAX Repayment Claims; Auditing Accounts; Returns for Income Tax Assessment; Deductions for Overdrafts and Mortgage Interest; Excess Profits Duty; Super Tax. Questions answered free.—W. R. Fairbrother, Accountant and Income Tax Specialist, 67/68, Cheapside, E.C.2. City 5688.

SILICA Flour, of all grades, from 20 mesh to 200 mesh; also Extra Fine and Superfine (air-flown) Flour Silica; our 120 mesh grade contains not more than 0·5 per cent. residue on interwoven silk test sieve; fine grinding a speciality; grinding of chemicals and minerals undertaken for the trade.—The Star Quarries, Ltd., Cathedral Chambers, 5, St. Werburgh Street, Chester.

1,000 OILSKINS. Black ex-Naval Oilskin Jackets, 45s. doz.; Oilskin Trousers, 35s. doz.; just the thing to wear for oily and dirty work; cash with order.—Welton, Contractor, Fratton Road, Portsmouth.

WANTED, experimental lab. materials.—W. Pattison, "Widnes."

PETROLOGICAL MICROSCOPES and other Microscopes bought, sold or exchanged. John Browning, (Dept. 24), 146, Strand, W.C.2.

WANTED 100 Kg. Diastase T.100—S.Z., 1 Rue Gabrielle, Paris, France.

Situations Vacant.

(Three lines, 3s.; each additional line, 1s.)

Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of them.

WANTED, in a British Dominion, a Working Foreman who thoroughly understands the bleaching of glue and gelatine by the hydrogen per-oxide process; good wages to suitable man and fare paid. Apply, in the first instance, giving full particulars of experience, age, and whether married or single, with copies of references, to Wm. Clayton, incorporated accountant, 72, Albion Street, Leeds.

Situations Wanted

(Twenty-seven words, 2s.; every additional nine words, 6d.)

METALLURGIST and TECHNICAL CHEMIST Assoc. Inst. M. M., M. Soc. Chem. Ind., wishes Partnership, or Situation with view to same in chemical manufacture, or any new venture with reasonable chance of success. 24 years' experience at home and abroad; knowledge engineering, electricity, and office management; languages, French and Portuguese; good organiser.—Box No. 9, CHEMICAL AGE Offices, 8, Bouverie St., E.C.4.

PRACTICAL CHEMIST is open to undertake analytical or research work. Power-plant Efficiency and Clay Industries a Speciality.—Box No. 12, CHEMICAL AGE, 8, Bouverie Street, E.C.4.

LABORATORY situation required. Routine testing and process control preferred. Age 37. Single. Several years' practical experience in works laboratories. Moderate salary (with prospects) to commence.—Box, CHEMICAL AGE OFFICES, 8, Bouverie Street, E.C.4.

SCIENTIFIC BOOKS AND SERIALS

JOHN WHELDON & CO. have the largest stock in the country of Books in all departments of Science (including a large selection on pure and applied Chemistry) and Natural History, also Transactions and Journals of Learned Societies, etc., in sets, runs, and single volumes or numbers.

Libraries or small parcels purchased.

38 GREAT QUEEN STREET, KINGSWAY, LONDON, W.C.2

Telephone: Gerrard 1412.

CELLULOID

SHEETS—RODS—TUBES.

SCRAP CELLULOID

Large or Small Parcels Suitable for all Purposes.

GREENHILL & SONS

8, Water Lane Ludgate Hill, LTD.

Phone Central 1304. LONDON, E.C. 4.